BILL NO. S-82-08-10 (AS AMENDED)

SPECIAL ORDINANCE NO. S-184-82

AN ORDINANCE authorizing the adoption of the Fort Wayne - Allen County Flood Protection Plan

WHEREAS, the Fort Wayne-Allen County Flood Protection Team has prepared a Flood Protection Plan which examines the past problems of flooding in the area and provides recommendations which promote the public health, safety, morals, convenience, order, and welfare in the process of development in accordance with the statutes of the State of Indiana; and

WHEREAS, the Fort Wayne-Allen County Flood Protection Plan and its recommendations are consistent with the general policy and pattern of development set forth in the Fort Wayne Comprehensive Plan.

NOW THEREFORE, BE IT ORDAINED BY THE COMMON COUNCIL OF THE CITY OF FORT WAYNE, INDIANA:

SECTION 1. That the Fort Wayne-Allen County Flood Protection Plan is hereby adopted in its entirety by the Common Council of the City of Fort Wayne and said Common Council supports the implementation of the recommendations outlined in the Plan;

Provided, however, that within ninety (90) days from and after the passage of this ordinance the proper authority provide this Common Council with the following written report:

(a) The quantity of accumulated silt and other debris in the portion of the Maumee River proposed for dredging in said report;
(b) An estimate of the effect of the five (5) miles dredging of the Maumee River as proposed in the Flood Protection Plan;
(c) An estimate of the cost of maintenance of the proposed dredging of the Maumee River and what governmental authority or authorities will pay for said dredging and maintenance.

SECTION 2. That this Ordinance shall be in full force and effect from and after its passage, and any and all necessary approval by the Mayor.

Councilmember

BILL NO. S-82-08-10 - as amended

SPECIAL ORDINANCE NO. S-184-82

AN ORDINANCE authorizing the adoption of the Fort Wayne - Allen County Flood Protection Plan.

WHEREAS, the Fort Wayne-Allen County Flood Protection Team has prepared a Flood Protection Plan which examines the past problems of flooding in the area and provides recommendations which promote the public health, safety, morals, convenience, order, and welfare in the process of development in accordance with the statutes of the State of Indiana; and

WHEREAS, the Fort Wayne-Allen County Flood Protection Plan and its recommendations are consistent with the general policy and pattern of development set forth in the Fort Wayne Comprehensive Plan.

NOW THEREFORE, BE IT ORDAINED BY THE COMMON COUNCIL OF THE CITY OF FORT WAYNE, INDIANA:

SECTION 1. That the Fort Wayne-Allen County Flood Protection Plan is hereby adopted in its entirety by the Common Council of the City of Fort Wayne and said Common Council supports the implementation of the recommendations outlined in the Plan.

SECTION 2. That this Ordinance shall be in full force and effect from and after its passage, and any and all necessary approval by the Mayor.

Councilmember

APPROVED AS TO FORM
AND LEGALITY

Bruce O. Boxberger, City Attorney

Read the first time in full and on motion by Eisbart, seconded by Stier, and duly adopted, read the second time by title and referred to the Committee Regulation (and the City Plan Commission for recommendation) and Public Hearing to be held after due legal notice, at the Council Chambers, ~~City-County Building,~~ Fort Wayne, Indiana, on ~~the~~ day of , 19__, at o'clock .M.,E.S.T.

DATE: 8-10-82

CHARLES W. WESTERMAN - CITY CLERK

Read the third time in full and on motion by Eisbart, seconded by DaQuinta, and duly adopted, placed on its passage. PASSED (~~LOST~~) by the following vote:

	AYES	NAYS	ABSTAINED	ABSENT	TO-WIT:
TOTAL VOTES	8	0	1		
BRADBURY	X				
BURNS	X				
EISBART	X				
GiaQUINTA	X				
~~NUCKOLS~~ Sergeant	X				
SCHMIDT	X				
SCHOMBURG	X				
STIER			X		
TALARICO	X				

DATE: 9-28-82.

CHARLES W. WESTERMAN - CITY CLERK

Passed and adopted by the Common Council of the City of Fort Wayne, Indiana, as ~~(ZONING MAP)~~ ~~(GENERAL)~~ (ANNEXATION) (SPECIAL) (APPROPRIATION) ORDINANCE (RESOLUTION) NO. S-184-82

on the 28th day of September, 1982.

ATTEST: (SEAL)

CHARLES W. WESTERMAN - CITY CLERK

Samuel J. Talarico

PRESIDING OFFICER

Presented by me to the Mayor of the City of Fort Wayne, Indiana, on the 29th day of September, 1982, at the hour of 11:30 o'clock A.M.,E.S.T.

CHARLES W. WESTERMAN - CITY CLERK

Approved and signed by me this 4th day of Oct. 1982, at the hour of 10 o'clock A.M.,E.S.T.

WIN MOSES, JR. - MAYOR

BILL NO. S-82-08-10 AS AMENDED

REPORT OF THE COMMITTEE ON REGULATIONS

WE, YOUR COMMITTEE ON Regulations TO WHOM WAS REFERRED AN ORDINANCE authorizing the adoption of the Fort Wayne - Allen County Flood Protection Plan

HAVE HAD SAID ORDINANCE UNDER CONSIDERATION AND BEG LEAVE TO REPORT BACK TO THE COMMON COUNCIL THAT SAID ORDINANCE DO PASS.

BEN A. EISBART, CHAIRMAN

JANET G. BRADBURY, VICE CHAIRMAN

PAUL M. BURNS

VICTURE L. SCRUGGS

ROY J. SCHOMBURG

4-28-82
DATE

CONCURRED IN
CHARLES W. WESTERMAN, CITY CLERK

BILL NO. S-82-08-10 - as amended

SPECIAL ORDINANCE NO. S-_____

AN ORDINANCE authorizing the adoption of the Fort Wayne - Allen County Flood Protection Plan.

WHEREAS, the Fort Wayne-Allen County Flood Protection Team has prepared a Flood Protection Plan which examines the past problems of flooding in the area and provides recommendations which promote the public health, safety, morals, convenience, order, and welfare in the process of development in accordance with the statutes of the State of Indiana; and

WHEREAS, the Fort Wayne-Allen County Flood Protection Plan and its recommendations are consistent with the general policy and pattern of development set forth in the Fort Wayne Comprehensive Plan.

NOW THEREFORE, BE IT ORDAINED BY THE COMMON COUNCIL OF THE CITY OF FORT WAYNE, INDIANA:

SECTION 1. That the Fort Wayne-Allen County Flood Protection Plan is hereby adopted in its entirety by the Common Council of the City of Fort Wayne and said Common Council supports the implementation of the recommendations outlined in the Plan.

SECTION 2. That this Ordinance shall be in full force and effect from and after its passage, and any and all necessary approval by the Mayor.

Councilmember

APPROVED AS TO FORM
AND LEGALITY

Bruce O. Boxberger, City Attorney

Insert in engineer's report

(a) the quantity of accumulated silt and other debris in the [redacted] portion of the Manumet River proposed for dredging in said report;

(b) an estimate of the effect of the five (5) miles dredging of the Manumet River as proposed in the Flood Protection Plan;

(c) [redacted] an estimate of the cost of maintenance of the Manumet River and what governmental authority or authorities will pay for said dredging and maintenance

BILL NO. R-82-09-46

RESOLUTION NO. R-

RESOLUTION IN FAVOR OF THE USE
OF FUNDS FOR ECONOMIC DEVELOPMENT
IN FORT WAYNE

WHEREAS, the City of Fort Wayne, through its Administrative and Legislative branches of Government, approved a plan providing funds to maintain employment and economic stability, and;

WHEREAS, that pool of funds was originally established to aid Fort Wayne in its fight to keep the International Harvester Company in Fort Wayne, and;

WHEREAS, the recent decision by International Harvester to relocate a portion of its plant highlights the need to continue efforts to assist existing companies as well as to bring new business and industry to the Fort Wayne Metropolitan Area.

NOW, THEREFORE, BE IT RESOLVED that the Common Council encourages the use of the pool of funds established in the City's fight for Harvester to promote economic stability and to attract new industry to Fort Wayne.

The Common Council further resolves that the Administration shall make existing and prospective businesses aware of the availability of this fund and shall develop guidelines for its use, all of which shall be subject to final approval by this body.

_____
Councilman

_____
Approved as to form and
legality

* Loan guarantee program. (State limited to $2 mill/10

"I move passage"

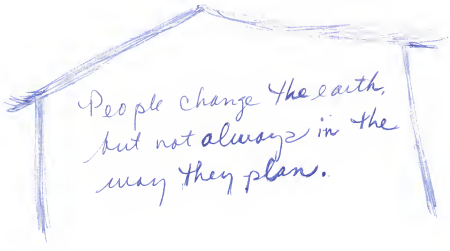
Mr. Chairman

Call for discussion:

I propose an amendment to the ordinance with the following intent: that within 90 days this Council be given a report, ~~with the~~ ~~Cost est. cost of maintenance of the~~ ~~of the~~ ~~that~~ on the amount of silt ~~normally moved down~~ in the Maurice River and the ~~anticipated~~ estimated effect on the 5 miles of dredging proposed in the Flood Protection Plan. Also included should be the est. cost for maintance & who would pay ~~for~~ it.

L-82-08-10

Since Council would vote on each & every allocation with discussion, I fail to see how anyone who is committed to the development of new jobs & a healthy Community can vote anyway but yes.



D-82-08-10

THE CITY OF FORT WAYNE

CITY-COUNTY BUILDING • ONE MAIN STREET • FORT WAYNE, INDIANA 46802

city plan commission

27 September 1982

TO: The Common Council
City of Fort Wayne

RESOLUTION
OF THE
CITY PLAN COMMISSION

BE IT HEREBY RESOLVED that the Fort Wayne City Plan Commission recommends DO PASS for the Fort Wayne-Allen County Flood Protection Plan and its accompanying ordinance, Bill No. S-82-08-10.

Certified and signed this
27th day of September 1982.

Dennis J. Grotrian
Secretary

SUSPENSION OF RULES

BILL NO. _____

COUNCILMAN _____, MOVED TO SUSPEND THE RULES ON THE PASSAGE OF BILL NO. _____, AT THE MEETING OF THE COMMON COUNCIL OF THE CITY OF FORT WAYNE, INDIANA HELD ON _____ THE _____ DAY OF _____, 19____. SAID MOTION WAS SECONDED BY COUNCILMAN _____, AND DULY PASSED BY UNANIMOUS VOTE OF ALL LEGALLY ELECTED MEMBERS OF THE COMMON COUNCIL. THE ABOVE BILL NO. _____ WAS THEN PLACED ON PASSAGE.

DATE: _____

_____ _____

CHARLES W. WESTERMAN - CITY CLERK PRESIDING OFFICER

	AYES	NAYS	ABSTAINED	ABSENT	TO-WIT:
TOTAL VOTES	9	0			
BRADBURY	X				
BURNS	X				
EISBART	X				
GiaQUINTA	X				
~~NICKOLS~~ SCRUGGS	X				
SCHMIDT	X				
SCHOMBURG	X				
STIER	X				
TALARICO	X				

PASSED AND ADOPTED BY THE COMMON COUNCIL OF THE CITY OF FORT WAYNE, INDIANA, AS _____.

ATTEST: (SEAL)

DATE: _____

_____

CHARLES W. WESTERMAN - CITY CLERK

REQUEST FOR ACTION

Approved as to form & legality when put in ordinance format
George Martin

Number assigned by Bruce O. Boxberger's Office: 6008

TO: City Attorney Bruce O. Boxberger
or
Associate City Attorney George Martin / 14th Floor Lincoln Bank Tower

FROM: (Name, Title & Department) Judith Kilgore, Planner II - Community Development & Planning - Room #800

APPROVED BY: Norman A. Abbett
(Person authorized to forward legal work)

DATE: August 3, 1982

SUBJECT: Fort Wayne-Allen County Flood Protection Plan
(File subject designation)

* * * * * * * * * * * * * * * * * * *

File # Assigned by Records Librarian

Date:

* * * * * * * * * * * * * * * * * * *

ACTION REQUESTED: Approve Flood Protection Plan Ordinance as to form and legality and prepare for immediate introduction by City Council.

(Continue on reverse side, if necessary)

CC: City Attorney Bruce O. Boxberger
(If request originally sent to an Associate City Attorney)
Mayor Winfield C. Moses, Jr.
Department Head of Requesting Party

DIGEST SHEET

TITLE OF ORDINANCE Fort Wayne-Allen County FLood Protection Plan

DEPARTMENT REQUESTING ORDINANCE Community Development & Planning

SYNOPSIS OF ORDINANCE Ordinance adopts Fort Wayne-Allen County Flood Protection Plan as public policy. The plan identifies the causes for the recurring floods in the area and recommends the most effective alternative in significantly reducing flood damage in the future. The Fort Wayne-Allen County Flood Protection Plan is in accordance to the Fort Wayne Comprehensive Plan.

EFFECT OF PASSAGE The City would have adopted a policy document for the long term solution to the flooding problem.

EFFECT OF NON-PASSAGE The city would have no policy document for the long term solution to the flooding problem.

MONEY INVOLVED (Direct Costs, Expenditures, Savings) Expenses are explained in the plan.

ASSIGNED TO COMMITTEE (J.N.)

ROLL # 18

IMAGING OFFICE SYSTEMS, INC
LOUISVILLE
CERTIFICATE OF AUTHENTICITY

City Clerk

THIS IS TO CERTIFY THAT THE MICROPHOTOGRAPHS APPEARING ON THIS FILM ARE ACCURATE AND COMPLETE REPRODUCTIONS OF THE RECORDS OF:

Fort Wayne

AS DELIVERED IN THE REGULAR COURSE OF BUSINESS FOR PHOTOGRAPHING.

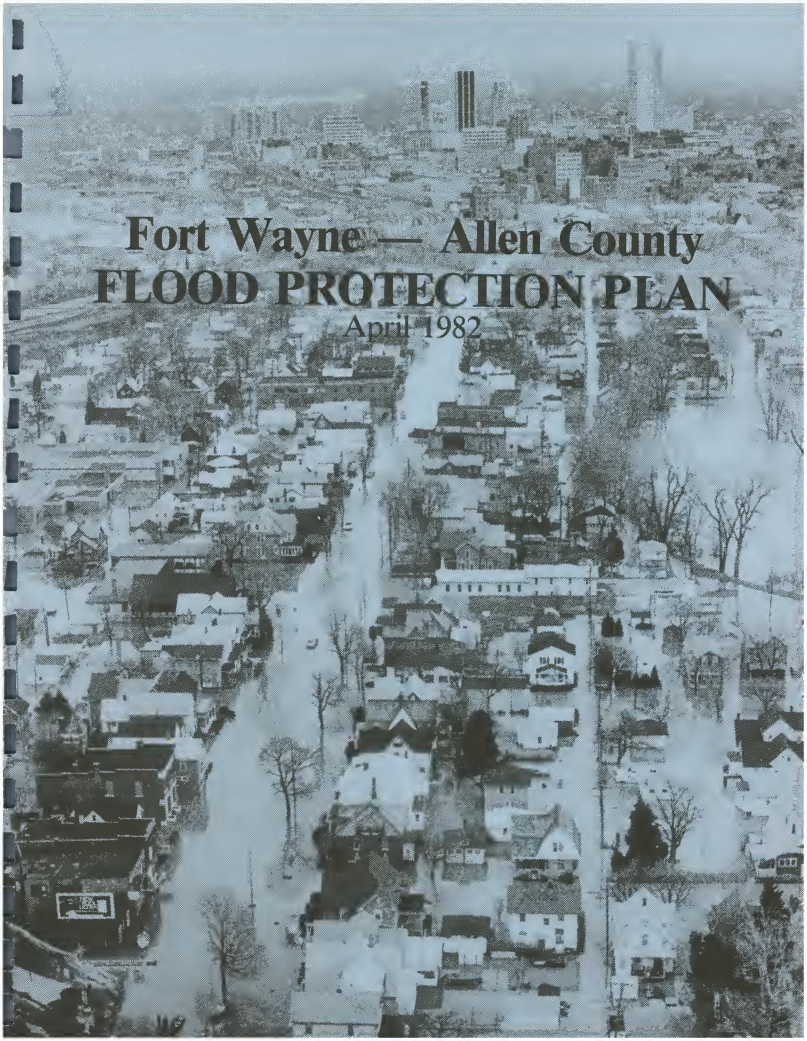
START: June 22, 1982

END: Sept 28, '82 cont. on Roll 19

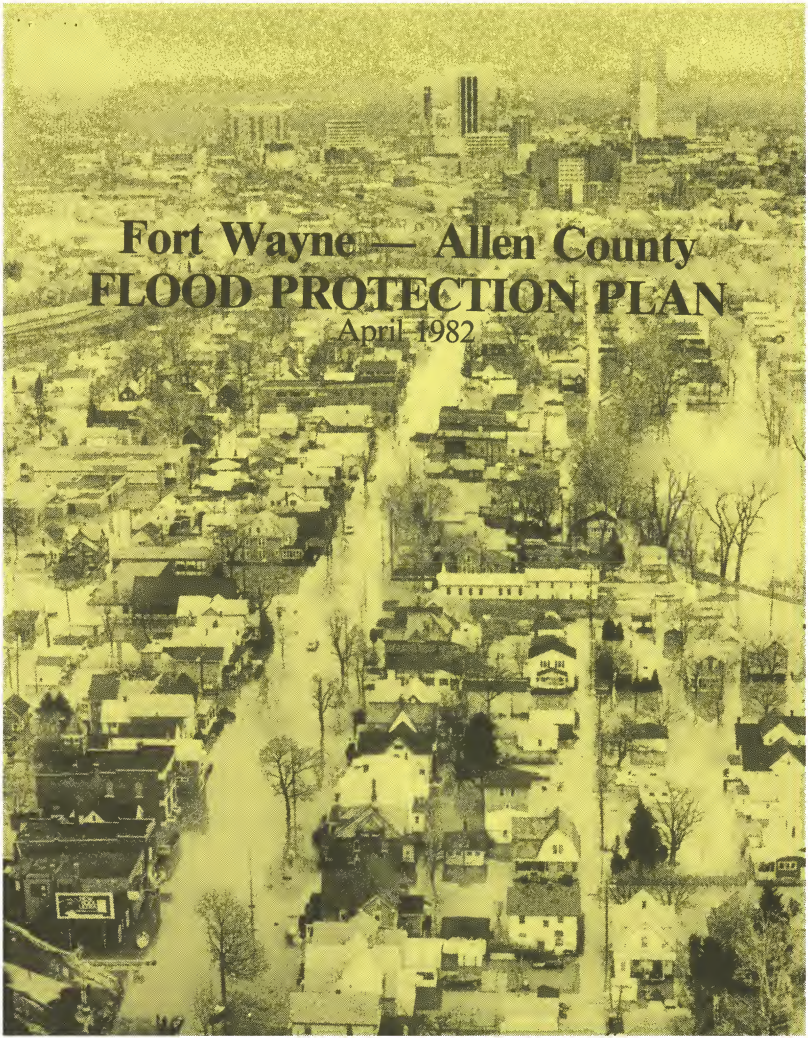
COUNTER: 2403

IT IS FURTHER CERITIFIED THAT THE MICROGRAPHIC PROCESSES WERE ACCOMPLISHED IN A MANNER AND ON FILM WHICH MEETS WITH REQUIREMENTS OF THE NATIONAL BUREAU OF STANDARDS FOR PERMANENT MICROPHOTOGRAPHIC COPY.

DATE: 10-23-98 OPERATOR: AB



Fort Wayne — Allen County
FLOOD PROTECTION PLAN
April 1982



Fort Wayne — Allen County
FLOOD PROTECTION PLAN
April 1982

FORT WAYNE - ALLEN COUNTY

FLOOD PROTECTION PLAN

ABSTRACT

CITY OF FORT WAYNE
WINFIELD MOSES, JR., MAYOR

CITY OF NEW HAVEN
TERRY WERLING, MAYOR

ALLEN COUNTY
COMMISSIONERS
RICHARD M. REGEDANZ
JACK DUNIFON
RICHARD M. ELLENWOOD

MAY 1982

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I. INTRODUCTION

In response to the Flood of 1982, Mayor Win Moses, Jr., directed the development of the Fort Wayne-Allen County Flood Protection Plan, in conjunction with the Mayor of New Haven and the Commissioners of Allen County. More than thirty city and county officials, including professional engineers, planners, and other specialists, were led by the Floodplain Management Advisory Group in evaluating alternatives to reduce damage from floods within Fort Wayne and the surrounding urbanized area. Extensive public input and comment on the Plan has been maintained throughout its development.

II. PAST FLOODS

The history of Fort Wayne is marked by periodic flooding problems. The worst flood occurred in March of 1913 when the Maumee River crested at 26.1 feet. Since then, significant flooding has occurred about once every five years in the Fort Wayne-Allen County area. Floods may occur as the result of rapid spring thaws of the snow blanket in either the St. Joseph or St. Marys Rivers' watersheds, heavy rainfall, or any combination of these factors. The variety of factors involved make flooding in this area unpredictable.

III. THE FLOOD OF 1982

Prior to the flood of March, 1982, the Fort Wayne-Allen County area experienced one of the harshest winters on record, and an economic recession that put nearly 12 percent of the area's labor force out of work. The community's energy and resources had been taxed by unanticipated public expenses and unexpected personal hardships.

The flood emergency began on March 12, when the Emergency Operations Center was activated to coordinate the public response to the rising floodwaters. As the flood emergency continued, Nebraska, Bloomingdale, Riverhaven, Belle Vista, Lakeside, Spy Run, and other neighborhoods were evacuated. Sandbags were used in several key locations to build makeshift dikes or to reinforce existing dikes. Thousands of community residents, many of them school children, volunteered their time to fill, transport, and place the sandbags. The Red Cross, the Salvation Army, and other service organizations provided clothing, food, and shelter to evacuees and volunteers. After visiting the area, the President of the United States declared Allen County a National Disaster Area, paving the way for Federal assistance in the recovery effort.

Before the flood emergency was over, residents, businesses, and local governments experienced more than $51,000,000 in damages and lost business. Approximately $10,000,000 were expenses and damages incurred by Fort Wayne and Allen County governments. These costs do not include intangible costs, such as social and economic disruption, environmental deterioration, and personal stress in coping with flood problems.

Although the Flood of 1982 caused extensive damage to property, it might have been considerably worse had the City's dikes failed or had the weather worsened. The potential costs of a breach of the Pemberton dike and the flooding of the Lakeside neighborhood have been estimated at nearly $25,000,000. The potential costs of a breach of the Griswold dike and the flooding of the Spy Run neighborhood have been estimated at more than $4,000,000.



Flooding was severe in the area of downtown north of Superior Street adjacent to the confluence of the St. Marys River and Spy Run Creek. Flood waters closed Clinton Street, forcing traffic into the downtown area to be rerouted. (Dean Musser, Jr./Fort Wayne Journal-Gazette)



The Nebraska Neighborhood was one of the first to be flooded by the St. Marys River. Pictured is the West Main Street area looking west from the St. Marys River bridge. (Dean Musser, Jr./Fort Wayne Journal-Gazette)



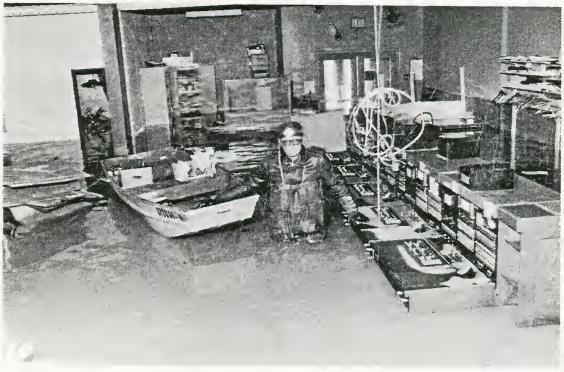
Approximately 2,600 homes were evacuated in the secondary impact areas. Pictured is the area along the Pemberton dike which barely escaped massive flooding. (Dean Musser, Jr./Fort Wayne Journal-Gazette)



The Pemberton dike area was saved by a tremendous flood fighting effort on the part of the volunteers. Over 287,000 sandbags were placed via a human chain in order to reinforce this dike. (Dean Musser, Jr./Fort Wayne Journal-Gazette)



Over a million sandbags were filled by the thousands of volunteers many of whom were high school students. Convoys of trucks transported the bags to dike areas where reinforcing was necessary. (Dailey Fogle/Fort Wayne Journal-Gazette)



General Telephone's Tecumseh Avenue facilities and offices were severely damaged, causing the company to permanently relocate. (John Stearns/Fort Wayne News-Sentinel)



Public facilities were hard hit by the flood. The facilities and grounds of the Fort Wayne Water Pollution Control Plant on the Maumee River received extensive damage. (Carl Hartup/Fort Wayne News-Sentinel)



The Water Filtration Plant at the confluence of the St. Joseph and St. Marys Rivers was continually threatened by floodwaters. The community narrowly escaped the loss of its fresh water supply. (Dean Musser, Jr,/Fort Wayne Journal Gazette)

An additional three inch rainfall in the St. Joseph or the St. Marys watersheds, the dislodging of a major ice jam upstream, the loss of the supply of potable water, or the isolation of segments of the City from emergency services could have dramatically increased the number of deaths and injuries from this disaster. Only by understanding the potential but unrealized dangers of the Flood of 1982, can one fully comprehend and judge actions to prevent the reoccurrence of flood damage.

IV. FLOOD PROTECTION CONCEPTS

The search for solutions to the flooding problems in Fort Wayne-Allen County began after the Flood of 1913. Many of the ideas for flood damage reduction that are examined in this Plan have been considered before, but never implemented.

The nine alternative solutions examined in the course of this planning effort embody, to varying degrees, several basic concepts of flood protection. The concepts that were given serious consideration included cut-off channels constructed to divert some proportion of the St. Marys and St. Joseph Rivers' flood flow around the built up areas of Fort Wayne, the evacuation of the floodplain, the construction of dams and reservoirs upstream of Fort Wayne, floodproofing buildings, modifying the river channels to increase their carrying capacity, and improved diking with better drainage and pumping capabilities.

V. EVALUATING THE ALTERNATIVES

The process of selecting the optimal solution for protecting Allen County residents from flooding involved careful analysis of alternatives, collecting

and considering public comment on the alternatives, and deciding which to implement. These tasks were performed by the Flood Protection Planning Team and the Mayor's Floodplain Management Advisory Group.

Public meetings were held in Fort Wayne on the alternative solutions. The general consensus of those attending these meetings was that they were tired of flooding problems and supported a long term, capital intensive project that would significantly reduce the flood problem. Several persons cautioned that long term solutions would not provide flood protection until the project was completed; and in the meantime, Fort Wayne and Allen County should be promoting short term measures. Other public comments focused on raising the dikes, protecting the dikes from off-road vehicles, and questionable effectiveness of flood proofing, and improving the flood-fighting abilities of local governments.

Nine alternatives were evaluated on the basis of their impact on social, economic, and natural environments; effectiveness and reliability, implementation capability; public acceptance; and energy and resource use.

The alternative that proposed total, permanent evacuation of all homes and businesses in the flooded areas was rejected as too costly ($229 million), too disruptive, and too controversial.

The alternative to construct upstream impoundments via dams and reservoirs was also considered too expensive ($209 million). It had the additional disadvantage of questionable environmental impacts, and was least likely to be implemented by local governments, since none of the sites are located within the affected area.

An alternative which combined evacuation of high risk areas with floodproofing of structures in lower risk areas was of comparatively moderate cost ($157 million). It was not chosen due to the disruption caused by land acquisition and the relocation of families and businesses as well as its inability to guarantee adequate floodproofing measures by building occupants.

The alternative to dredge and widen the rivers to the degree necessary to prevent flooding was also rejected, due to its high cost ($172 million) and its detrimental effects on the river and its banks. Evacuation of neighboring properties would also be necessary.

An alternative proposing total diking and floodwall protection with internal drainage improvements was rejected for aesthetic reasons. In addition, its relatively low initial cost advantage ($113 million) was judged to be offset by the lack of reliability of the solution, since continuous maintenance would be required. Extensive pumping would also boost operating costs.

The remaining alternatives all included one or more diversion channels. The proposal that suggested some river dredging with a diversion of 80% of the St. Marys River 100-year floodwaters through a Trier Ditch Cut-Off was the least expensive of all alternatives ($108 million), but it failed to provide additional protection until the project was completed.

The remaining two alternatives included the construction of a Trier Ditch Cut-Off to divert 40% of the St. Marys River 100-year floodwaters and levee improvements. Of the two, the alternative considered best was the least expensive ($119 million vs $153 million), and the most compatible with the community's Rivergreenway objectives.

VI. THE PROPOSED SOLUTION (ALTERNATIVE #4)

The proposed solution combines several of the best features of the other alternatives. The measures proposed emphasize considerable dike and levee improvements, internal drainage system improvements, additional pumping capacity, some river dredging, and the construction of the Trier Ditch Cut-Off. The Cut-Off would be designed to divert 40% of the 100-year floodwaters of the St. Marys River to the east of Fort Wayne. Figure 1 illustrates the location of the major elements of the proposed solution.

Some of the urgent dike and levee improvements are currently being negotiated with the Corps of Engineers and the Federal Emergency Management Agency. The restoration of the Pemberton dike, the protection of the Fort Wayne Water Pollution Control Plant, and the installation of floodgates on sewer outlets have already been initiated by Mayor Moses, in conjunction with the federal agencies, and represent over $1 million in immediate needs for flood prevention.

A. LEVEES

The proposed solution includes improvement to the levees along the Maumee, St. Marys, and St. Joseph Rivers. These improvements include raising levee elevations, reconstruction, or construction of new levees.

The design criteria establishes that the height of the levees shall be equal to the calculated flood stage elevation based upon 40% of the St. Marys River 100-year floodflow being diverted through the Trier Ditch Cut-Off, plus two feet for freeboard. This levee design elevation means that the existing

levees should be improved to afford increased protection over existing conditions, but will not provide full flood protection until the Trier Ditch Cut-Off is completed.

Generally, the levee heights in the Lakeside area are adequate, and only repairs and reinforcement of the existing dikes are necessary. The levees along the St. Joseph River, Spy Run Creek, and the St. Marys River would require only moderate increases to meet the design levels. The levee work should begin in the Summer of 1982 and be completed by 1985.

B. BACKWATER GATES

Under normal conditions, storm water drains off the streets into storm sewer pipes, and eventually into the area's three rivers. During times of high river stages, river water backs up the storm sewer pipes and flows into the street. This can be prevented if backwater gates are installed on storm sewer pipes where they empty into the rivers. Recent surveys of all existing storm sewer outlets indicate that 93 outlets do not have backwater gates. Installation of backwater gates can begin in the summer of 1982 and can be completed by 1983.

C. SEWERS AND PUMP STATIONS

Another improvement to interior drainage is the rehabilitation of all major combined sewer overflow relief stations within the City and the construction of a new relief station along Junk Ditch. Combined sewer overflow relief stations are pump stations designed to pump combined storm and sanitary sewage into the river when heavy rains overload the sewage treatment facilities.

All of the existing relief stations in Fort Wayne can be readily improved with the exception of the Griswold Avenue facility. This station was determined to be undersized and a larger facility is proposed.

Additional work to the internal drainage systems that deliver flows to the respective stations is necessary. These improvements would insure that the areas drain effectively during flood periods which are coincidental with heavy rainfall.

The Morton Street, Tecumseh Street, Camp Allen Drive, and Brown Street stations require the improvement of the high head pumping capabilities of the pumps. This requires the replacement of one of the pumps in each station with a pumping system powerful enough to overcome the pressure of the floodwater at the outlets. The Griswold Avenue and Third Street stations will require the same type of improvements, but they will also require additional pumps to increase their capacity. A new pump station is also necessary along Junk Ditch. This station would have the capability of draining the Junk Ditch area during high levels of the St. Marys River.

In view of the high cost of this task, it should begin in the summer of 1982 and be phased over several years for completion in 1986.

D. RIVER DREDGING

To accomodate the design flood flows on the St. Joseph and Maumee Rivers, dredging and channel improvements to remove siltation in three areas are proposed. These are at the confluence of the St. Joseph and St. Marys Rivers, downstream from the confluence to the Hosey Dam, and downstream from the Trier

Ditch Cut-Off and Maumee River confluence. The implementation schedule indicates commencing dredging in 1983 with completion by 1986.

E. DITCH CLEANING

It is proposed that Fairfield Ditch, Junk Ditch, and Spy Run Creek be cleaned to improve flow capacities. The Junk Ditch would be cleaned from the St. Marys River to the Norfolk & Western Railroad. The Fairfield Ditch would be cleaned from the St. Marys River to the Norfolk & Western Railroad, and Spy Run Creek would be cleaned from the St. Marys River to Grove Street. Ditch cleaning should be accomplished in 1982.

F. LAND AND EASEMENT ACQUISITION

The solution proposes acquisition of some properties located within the floodplain. Spot acquisition to accommodate levee improvement is also proposed for the Nebraska area and the Oswego Avenue area wherever individual structures are found to impair the effectiveness of the flood control system.

Four areas are proposed for consideration of evacuation and relocation. They are the "thumb" area of downtown, the Michael Street/Ross Street area, the Riverhaven area, and Fairmount Place. While it may be less expensive to acquire some of these properties than to protect them, such decisions cannot be made on the basis of cost alone.

Public review and further study of alternatives to evacuation can be undertaken while the Plan is implemented. Indeed, a project of this magnitude will require modification and readjustment during its implementation. If evacuation is necessary, it cannot and should not be mandated at this time. The

Plan has been deliberately designed to be flexible, permitting phased, coordinated, but independent implementation of most of its elements. Accordingly, the schedule proposes acquisition by 1990, but the schedule is not critical to the success of the Plan.

G. TRIER DITCH CUT-OFF

Some form of the Trier Ditch Cut-Off has been considered a viable flood control measure for this area since 1913. The Cut-Off proposed here is a diversion channel designed to carry approximately 40 percent of the St. Marys River flood flow around Fort Wayne. Because the Trier Ditch Cut-Off is such a major project in the Plan in terms of cost and time, the task of constructing the channel is further broken into subtasks. These subtasks include design, right-of-way acquisition, bridge construction, St. Joseph River channel improvements, constructing the diversion structure, and the Maumee River channel improvements.

The design subtasks should begin in 1983 and be completed in 1985. Right-of-way acquisition should commence in mid-1983 and be completed by 1986. Highway, railroad, and bridge construction should begin in 1985 with a completion date to coincide with that of the balance of the Trier Ditch construction. The St. Joseph River channel improvements, diversion structure, and Maumee River improvements should commence in 1987. These dates could be staggered if found advantageous. However, it is probable that the funding will come from a single source and thereby allow all phases of work to begin concurrently. The Trier Ditch Cut-Off should be completed by 1990.

H. FLOOD FIGHTING CAPABILITY

It may be several years before all facets of the Flood Protection Plan are completed. In the interim, it is expected that the Fort Wayne-Allen County community will experience additional floods of varying severity. To prepare for these floods, the flood fighting capability of the community can be improved. A program to improve such capability will include the following:

1. Increased training for public and private flood fighters to adequately handle flood conditions. This training would include sandbagging techniques.
2. Development and implementation of a standard operating procedure for flood fighting in each neighborhood.
3. Development of an evacuation plan to include flood warning systems for each neighborhood threatened by past floods.
4. Preparation of maps identifying weak points in dikes and lines of defense for flood fighting.
5. Floodproofing of selected public facilities and private buildings. In a few areas where emergency sandbagging would be ineffective, private and public buildings could be protected by floodproofing. This is not to suggest an extensive commitment of resources to floodproofing, but rather the protection of a few structures that cannot be protected by other flood control measures.

Several major flood fighting initiatives have already been instituted by city and county officials and neighborhood representatives, with the Federal Emergency Management Agency's technical assistance. Standing operating procedures are being developed for each neighborhood, and training sessions for a neighborhood network of immediate flood warning and response will be undertaken before the end of 1982.

Promotion of flood insurance for structures and their contents will be expanded as will floodproofing advice for public buildings, private facilities, and homes. Detailed documentation of the Flood Fighting Plan is being developed and will be separately published. Its contents are being closely coordinated with the Flood Protection Plan. When each has been completed and adopted, the two will constitute an integrated, comprehensive response to the flooding problems of Fort Wayne-Allen County residents.

Strengthening the City's floodplain zoning ordinance would also help minimize future flood hazards. Specifically, the nonconforming section could be made more stringent. Also, a provision could be added that would require new development to have at least two feet of freeboard over the 100-year flood level.

VII. IMPLEMENTATION

The implementation of the plan will require a combination of funding commitments at each level of government. At this time, it is not possible nor practical to attempt to identify the degree of funding by each agency at every level. However, the construction of the Trier Ditch, in terms of cost, scope of work, and degree of intergovernmental involvement, is clearly beyond the capacity of the local governments to address, singly or in combination. A Federal government commitment, most likely through the adoption of the Trier Ditch project under the auspices of the Corps of Engineers, is essential if a solution to flooding is to be found for Fort Wayne and Allen County.

The estimated cost of implementation by major tasks for the structural elements is as follows:

Levees	$ 6,784,000
Backwater Gates	285,000
Pumping Stations/Sewers	27,755,000
River Dredging	3,600,000
Ditch Cleaning	400,000
Acquistion	17,387,000
Trier Ditch	63,070,000
TOTAL	$119,301,000

The proposed plan includes areas in the City of Fort Wayne, the City of New Haven, and Allen County. Consequently, it will be necessary to create a single entity which has legal authority to plan, design, construct, operate, and maintain flood control facilities within and across each of these three existing units of government.

A special flood control district will need to be created to accept Federal, state, and local assistance, as well as to tax, bond, and acquire real property. In the interim, a group of city, county, and state officials will be joined by representatives of interest groups, the general public, and by Federal officials in implementing the Plan. They will monitor ongoing activity and guide the Plan through the regulatory and adoption process at each level of government affected.

The schedule proposed for the implementation of the Fort Wayne-Allen County Flood Protection Plan is aggressively optimistic (see Figure 2). It is poss-

ible to complete the Plan on time if all levels of government and the public remain committed to, and supportive of, our objective to minimize flooding in the Fort Wayne-Allen County community. An important first step in the successful implementation of the Plan is the completion of the 18 month work program. Figure 3 lists the different components of the program and identifies potential funding sources for over $10,000,000 worth of projects.

VIII. CONCLUSION

Flooding has long been recognized as a problem in the Fort Wayne-Allen County area. Since the first studies of the flooding problem undertaken after the Great Flood of 1913, several alternative solutions have been investigated, but unfortunately, forgotten before they could be implemented. This Flood Protection Plan represents a commitment on the part of local citizens, the Allen County Commissioners, the Mayor of New Haven, and the Mayor of Fort Wayne to end this unproductive cycle. The arduous task of solving the Fort Wayne-Allen County flood problem has begun. Only through the continued cooperation and assistance of all elected and appointed officials representing Indiana citizens, can be eliminate the continuous threat to the lives and property of our residents be eliminated.

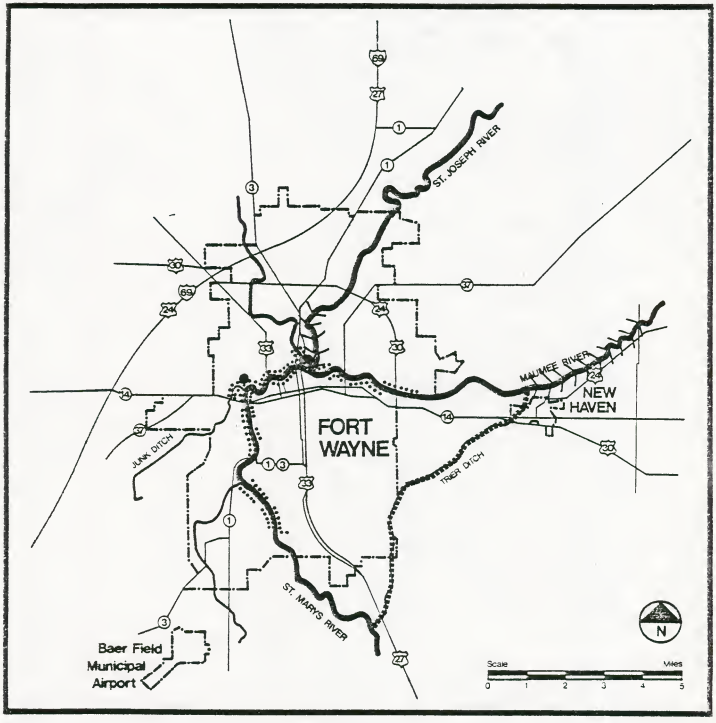


FIGURE 1

Proposed Solution

- ● Proposed Pumping Stations
- ••• Proposed Levees and Floodwalls
- 〉 Channel Improvements
- ▪▪▪▪ Trier Ditch Cut-Off (40%)

FIGURE 2

FORT WAYNE-ALLEN COUNTY FLOOD PROTECTION PLAN

IMPLEMENTATION SCHEDULE

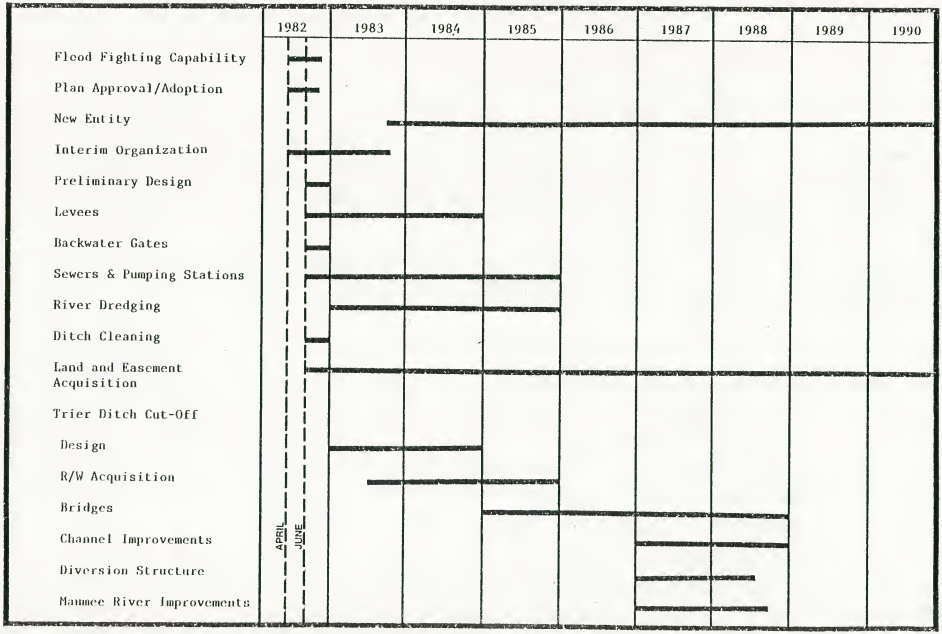


FIGURE 3

FORT WAYNE-ALLEN COUNTY FLOOD PLAN

18 MONTH WORK PROGRAM[1]

	COST ESTIMATE	POTENTIAL FUNDING SOURCE
I. FLOOD FIGHTING		
A. River Gages	$ 15,000.00	U.S. Geological Survey Dept. of Natural Resources City
B. Flood Emergency Action Plan	N/A	
II. DIKES		
A. Minor Repairs		
1. Waynedale Spot Fill	$ 1,400.00	City Budget
2. Boat Ramp	$ 3,000.00	City Budget
3. Leave Flood-Fighting Fill	N/A	
B. Repair to Pre-Flood Condition		
1. Pemberton	$ 200,000.00	City Budget
	$ 131,000.00	Public Law 84-99
2. 14 Miscellaneous Sections		
a. Proof Rolling & Repair	$ 104,900.00	Public Law 84-99
b. Tree Removal	$ 80,000.00	Conservancy District
C. Increase Height		
1. Nebraska (some acquisition)	$ 800,000.00	State of Indiana
2. Main to Clinton	$ 300,000.00	Park Bond
	$ 300,000.00	Conservancy District
3. Spy Run/St. Joe	$ 900,000.00	State of Indiana
4. Waynedale	$ 200,000.00	Conservancy District
D. New Construction		
1. Lagoon Dike[2]	$ 57,200.00	City Utilities
2. Sewer Treatment Plant[2]	$ 54,100.00	City Utilities

18 MONTH WORK PROGRAM[1] (cont)

		COST ESTIMATE	POTENTIAL FUNDING SOURCE
III.	BACKWATER GATES[3]		
	A. Spy Run Creek	$ 10,100.00	City Utilities
	B. St. Joe River	$ 37,600.00	City Utilities
	C. St. Marys River	$ 33,000.00	City Utilities
	D. Maumee River	$ 7,800.00	City Utilities
	E. Fairfield Ditch	$ 9,200.00	City Utilities
IV.	CHANNEL IMPROVEMENTS		
	A. Confluence Area	$ 500,000.00	Conservancy District
	B. MESA	$ 150,000.00	Park Bond
	C. Fairfield Ditch	$ 200,000.00	Allen County
	D. State Street[4]	$ 120,000.00	Allen County
V.	ACQUISITION		
	A. Fairmount Place ($350,000 over 6 year period)	$ 200,000.00	Community Development Block Grant
	B. Part of Thumb	$ 300,000.00	State of Indiana
VI.	PUMPING STATIONS		
	A. Tecumseh and Morton Street and Emergency Pumping Wells	$ 200,000.00	City Utilities
VII.	DAMAGE SURVEY REPORTS[5]		
	A. Sewers	$ 1,103,700.00	City Utilities
	B. Utilities	$ 15,200.00	City Utilities
	C. Civil City	$ 364,200.00	City Budget
VIII.	FEDERAL EMERGENCY MANAGEMENT AGENCY		
		$ 4,449,000.00	FEMA
	TOTAL	$10,846,400.00	

NOTES:
1. Does not include Spy Run reconstruction
2. Full DSR amount shown for Lagoon and Sewer Treatment Plant dikes
3. Does not include $33,200 FEMA funds.
4. Dredge entire sandbar.
5. Does not include FEMA "front" money.

Fort Wayne — Allen County
FLOOD PROTECTION PLAN

April 1982

ALLEN COUNTY

COUNTY COMMISSIONERS
Richard Ellenwood, President
Jack Dunifon
Richard Regedanz

COUNTY COUNCIL
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James H. Blanks, Sr.
Sondra Ann Houlihan
Jack C. McComb
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Terry Werling

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I. Introduction

The purpose of the Fort Wayne-Allen County Flood Protection Plan is to identify, analyze, and evaluate alternatives to minimize the area's flood control problems and to select the optimal solution for implementation. This document is the product of the City and County's response to the flood of 1982. The Flood Protection Plan is directed toward reducing damage from floods within Fort Wayne and the surrounding urbanized area.

II. Past Floods

The history of Fort Wayne is marked by periodic flooding problems. The worst flood occured in March of 1913 when the Maumee River crested at 26.1 feet. Since then, significant flooding has occured about once every five years in the Fort Wayne-Allen County area. Floods may occur as the result of rapid spring thaws of the snow blanket in either the St. Joseph or St. Marys watersheds, heavy rainfall, or any combination of these factors. The variety of factors involved make flooding in this area unpredictable.

III. The Flood of 1982

Prior to the flood of March 1982, the Fort Wayne-Allen County area had been experiencing one of the harshest winters on record, and an economic recession that put nearly 12 percent of the area's labor force out of work. The community's energy and resources had been taxed by unanticipated public expenses and unexpected personal hardships.

The flood emergency began on March 12, when the Emergency Operations Center was activated to coordinate the public response to the rising floodwaters. As

the flood emergency continued, Nebraska, Bloomingdale, Riverhaven, Belle Vista, Lakeside, Spy Run and other neighborhoods were evacuated. Sandbags were used in several key locations to build makeshift dikes or to reinforce existing dikes. Thousands of community residents, many of them school children, volunteered their time to fill, transport and place the sandbags. The Red Cross, the Salvation Army and other service organizations provided clothing, food and shelter to evacuees and volunteers. After visiting the area, the President of the United States declared Allen County a national disaster area, paving the way for Federal assistance in the recovery effort.

Before the flood emergency was over, residents, businesses, and local governments experienced more than $34,600,000 in damages, lost business, and lost time. Nearly one-third of this total, or approximately $11,000,000, were expenses and damages incurred by the Fort Wayne and Allen County governments. These costs do not include the intangible costs, such as social and economic disruption, environmental deterioration, and personal stress.

Although the flood of 1982 caused extensive damage to property, it might have been considerably worse had the City's dikes failed in several key locations. The potential costs of flooding of the Lakeside neighborhood from a breach of the Pemberton dike and have been estimated at nearly $24,000,000. The potential costs of flooding of the Spy Run neighborhood from a breach of the Griswald dike have been estimated at more than $3,000,000.

An additional three inch rainfall in the St. Joseph or the St. Marys watersheds, the dislodging of a major ice jam upstream, the loss of the supply of potable water, or the isolation of segments of the City from emergency ser-

vices could have dramatically increased the number of deaths and injuries from this disaster. Only by understanding the potential but unrealized dangers of the flood of 1982, will the community be able to fully comprehend and judge actions to prevent the reoccurrence of flooding.

IV. Alternative Solutions

The search for solutions to the flooding problems in Fort Wayne -Allen County began before the flood of 1913. Many of the ideas for flood damage reduction that are examined in this Plan have been considered before, but never implemented.

The nine alternative solutions examined in the course of this planning effort embody, to varying degrees, several basic concepts of flood protection. Some of the alternatives utilize one concept exclusively, while others utilize a combination of several concepts. The following is a concise list of the alternatives that were given serious consideration.

ALTERNATIVE 1:

Construct a Trier Ditch Cut-Off that will carry 80 percent of the design flood volume of the St. Marys and increase the Maumee River cross section downstream from New Haven. Dredge the St. Joseph River in accordance with the 1959/1976 Corps report. Upgrade and expand, as necessary, the internal storm and relief sewer systems, including pump stations, to adequately drain the areas behind the protective dikes and levees.

ALTERNATIVE 2:

Implement the Corps of Army Engineers 1959/1976 Flood Prevention and Protection Plans. This includes a Trier Ditch Cut-Off that will carry 40 percent of the design flood volume of the St. Marys River, increase the Maumee River's cross section downstream from New Haven, and extensive levee floodproofing and dredging in the urbanized area.

ALTERNATIVE 3:

Acquire and evacuate all potentially flooded properties within the design flood areas. This would include the relocation of all families and businesses and demolition of all structures within the area. This land would be designated open space for park and recreational type uses.

ALTERNATIVE 4:

Construct the Trier Ditch Cut-Off that will carry 40 percent of the St. Marys River and dredge the St. Joseph River. Construct dikes and levees as necessary to protect to the design flood stages, included internal drainage improvement.

ALTERNATIVE 5:

Construct upstream impoundments for storage on the St. Joseph and St. Marys watersheds.

ALTERNATIVE 6:

Flood-proof all structures subjected to flooding of less than two feet. All Structures within the designated flood area that could not be flood-proofed would be evacuated and the area cleared for open space.

ALTERNATIVE 7:

Improve the three rivers' cross sections and profiles to accomodate the peak discharges.

ALTERNATIVE 8:

Construct a St. Joseph River Cut-Off beginning at the Cedarville Reservoir and draining southeasterly to the Maumee and the construction of the Trier Ditch Cut-Off (40 percent diversion). The Maumee River would be dredged to adequately accept these flows at their confluences, as well as for a limited length downstream.

ALTERNATIVE 9:

Increase the height and length of existing dikes and levees, provide new dikes where necessary, and construct or modify pumping stations and appurtenances for internal drainage.

V. Evaluation and Selection of the Optimal Solution

The process of selecting the optimal solution for protecting the Allen County residents from flooding involved the careful analysis of alternatives, collecting and considering public comment on the merits of the alternatives, and deciding which solutions to implement. These tasks were performed by the Flood Protection Planning Team and the Mayor's Floodplain Management Advisory Group.

Public meetings were held in Fort Wayne to gather comment on the alternative solutions. The general consensus of the persons attending these was that they were tired of the periodic flooding problems and would support a long term,

capital intensive project that would significantly reduce the flood problem. Several persons cautioned that long term solutions would not provide flood protection until the project was completed, and in the meantime, Fort Wayne and Allen County should be promoting short term solutions. Other public comments focused on raising the dikes, protecting the dikes from off-road vehicles, the questionable effectiveness of floodproofing, and improving the flood-fighting abilities of local governments. The evaluation of the nine alternatives was based on their impact on social, economic and natural environments; effectiveness and reliability; implementation capability; public acceptance; technical feasibility; energy and resource use; and monetary cost. The alternatives costs range from $108,000,000 to $229,000,000. In the process of deciding which alternative solution to implement, three conclusions were drawn: (1) The Federal Emergency Management Agency has recommended, and the Corp of Engineers will partially fund short range actions to reduce the flood hazard; (2) Viable comprehensive solutions must contain plans to divert some portion of the St. Marys River 100 year flood water around Fort Wayne via the Trier Ditch diversion channel; (3) The optimal comprehensive solution is one that will afford some degree of flood protection prior to completion of the Trier Ditch diversion channel. Based on these conclusions, the optimal solution is Alternative 4. This solution involves a 40 percent diversion through the Trier Ditch, channel improvements to all three rivers and Spy Run Creek, limited evacuation of floodplain areas, and limited improvements to dikes and levees.

VI. Implementation

The phased implementation of Alternative 4 involves the completion of 12 seperate tasks, each integral to the ultimate success of all of the flood con-

trol measures. These 12 taskes are improving the community's flood fighting capability, Plan approval and adoption, creating a new entity to implement the Plan, creating an interim organization, continuing the preliminary design, constructing levees, installing backwater gates, improving storm sewers and pumping stations, river dredging, ditch cleaning, acquiring land, and constructing the Trier Ditch diversion channel. An implementation schedule has been suggested indicating that all of these tasks could be completed by 1989, with the exception of the new entity which would have continuing responsibility for operating and maintaining flood control facilities.

One model of a new entity with the necessary powers and authority to implement the Flood Protection Plan is the conservancy district. Conservancy districts are autonomous units of government established to address specific problems, in this case, flood control. The districts may encompass all or parts of any city and county in Indiana. Through its Board of Directors, a conservancy district has the powers to tax, bond, condemn real property, and enter into agreements with Federal and State agencies. Because of its structure and power, the conservancy district is believed to be one of the best ways to implement flood control projects.

Three programs offered by the U.S. Army Corps of Engineers appear particularly promising as funding sources for the Plan's projects. These programs are Emergency Dredging, Snagging and Clearing, and Flood Control. Projects funded under these programs are generally small scale and of short duration. In addition to these, the Corps is authorized to request appropriations from Congress for construction of large scale projects. Until such appropriations are

granted, the programs offered by the Corps can only be viewed as limited solutions to a much broader problem.

VII. Conclusion

Flooding has long been recognized as a problem in the Fort Wayne-Allen County area. Since the first studies of the flooding problem undertaken after the flood of 1913, several alternative solutions have been investigated, considered, but unfortunately, forgotten before they could be implemented. This Flood Protection Plan represents a desire on the part of local citizens and their elected City and County governments to end this unproductive cycle. Only by taking direct action now, with the full support of the State and Federal governments, can begin the arduous task of solving the area's flood problem.

Executive Summary

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Acknowledgements

The Flood Protection Planning Team wishes to thank the United States Army Corps of Engineers, the Indiana Department of Natural Resources, the Federal Emergency Management Agency (FEMA), and the FEMA Interagency Task Force (See Appendix 4) for their cooperation and assistance in the preparation of this plan. The Team also wishes to acknowledge the Fort Wayne News-Sentinel and the Fort Wayne Journal-Gazette for the photographs used in this document. Finally, the Team wishes to acknowledge the Mayor's Floodplain Advisory Group and the citizens of the community who participated in the two public meetings. The comments received from these concerned citizens provided valuable guidance in the development of this plan.

Credits

The following individuals participated in the planning and writing of this document.

FLOOD PROTECTION PLANNING TEAM

Norman A. Abbott, AICP, Director of Planning, City of Fort Wayne, Department of Community Development and Planning
Robert Arnold, Director, City of Fort Wayne, Department of Parks and Recreation
David Anderson, Chief Street Engineer, City of Fort Wayne, Department of Transportation
Ronald Bonar, P.E., President, Bonar and Associates
Walt Borcherding, Project Engineer, City of Fort Wayne, Department of Transportation
Kenric McCrory, Planner III, City of Fort Wayne, Department of Community Development and Planning
Carl O'Neal, Director, City of Fort Wayne, Department of Transportation
Jack Suter, Executive Director, Allen County Plan Commission
William Sweet, P.E., Allen County Surveyor

PRINCIPAL PARTICIPANTS

Kenric McCrory, Planner III, City of Fort Wayne, Department of Community Development and Planning
Andy Dodzik, P.E., Vice President, Bonar and Associates
Duane Embury, P.E., City of Fort Wayne, Department of Water Pollution Control
Mark Gensic, P.E., Bonar and Associates
Michael Graham, Planner II, City of Fort Wayne, Department of Community Development and Planning
Denarie Kane, Urban Designer II, City of Fort Wayne, Department of Community Development and Planning
Judith Kilgore, Planner I, City of Fort Wayne, Department of Community Development and Planning
Keith Luck, Planner I, City of Fort Wayne, Department of Community Development and Planning
Nancy Niemann, Secretary A, City of Fort Wayne, Department of Community Development and Planning
Charles Wickensheimer, P.E., City of Fort Wayne, Department of Water Pollution Control
Darrell Post, Engineer, Bonar and Associates
William Spohn, Environmental Planner, Bonar and Associates

PARTICIPANTS

Kim Bickel, Engineer, Bonar and Associates
Fred Baughman, Commission Coordinator, City of Fort Wayne, Department of Economic Development
Art Ehinger, Engineer, Bonar and Associates
Mark Gecowets, Designer I, City of Fort Wayne, Department of Community Development and Planning
Philip Gersten, U.S. Army Corps of Engineers
Jeffery Grogg, Project Engineer, City of Fort Wayne, Department of Transportation
Kevin Howell, Assistant Finance Specialist, City of Fort Wayne, Department of Economic Development
Richard Knappenberger, Project Engineering, City of Fort Wayne, Department of Transportation
Richard Kunkel, Land Use Specialist, City of Fort Wayne, Department of Community Development and Planning
Gordon Lance, Indiana Department of Natural Resources
Gralan Lax, Drafting Technician, City of Fort Wayne, Department of Community Development and Planning
Michael McClue, Planner I, City of Fort Wayne, Department of Community Development and Planning
Posey Mills, U.S. Army Corps of Engineers
Barbara Moe, Landscape Architect, City of Fort Wayne, Department of Parks and Recreation
Thomas Palone, P.E., City of Fort Wayne, Department of Water Pollution Control
Dave Ross, P.E., Bonar and Associates
Diane Schuster, Finance Specialist, City of Fort Wayne, Department of Economic Development
John Stafford, Senior Planner, Allen County Plan Commission
F. Robert Woenker, Planner II, City of Fort Wayne, Community Development and Planning
Beatrix Wilkening, Assistant Planner I, City of Fort Wayne, Community Development and Planning
Karen King Williams, Assistant Compliance Administrator, City of Fort Wayne, Community Development and Planning

Cover Photograph

Dean Musser, Jr., Fort Wayne Journal-Gazette

Introduction

Section One

I. Introduction

The flood of 1982 was the latest in a series of floods that have plagued the Fort Wayne-Allen County community for more than 150 years. Like many of its predecessors, this flood has raised the public's concern for the development and implementation of preventive flood measures. The purpose of this Plan is to address those concerns.

Recovery preparations began immediately after the 1982 flood emergency was declared. Local officials decided that a recovery plan could be best handled in three separate phases by different task forces. The task forces were, in turn, coordinated by a policy committee. A brief explanation of each phase is provided below.

Phase I During the flood, the main purpose of the Phase I task force was to manage the flood emergency operations. Responsibilities included the coordination of sandbagging, evacuation, and security measures. After the flood, members of the task force were assigned new responsibilities. Some of these responsibilities include the critique of the City's existing flood plan, and its management of the flood emergency efforts. If the emergency efforts are evaluated as inappropriate, then the task force will develop a revised emergency plan based upon the City's experience with the 1982 flood.

Phase II Fifteen task force members are responsible for the implementation of Phase II. Within 45 days of the flood disaster, the task force delivered the services needed to recover from the

flood. Some of these services were to clean-up, to provide temporary housing, and to inform flood victims of the numerous assistance programs.

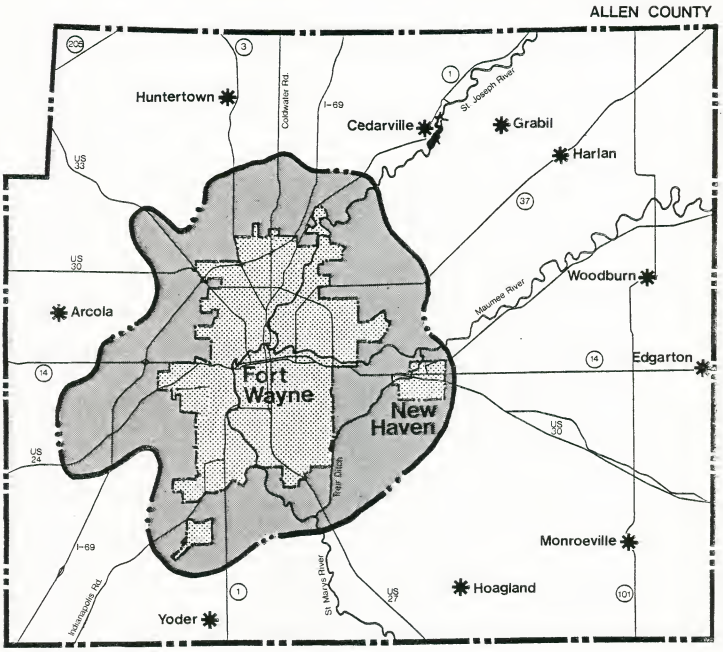
Phase III

The purpose of Phase III was to develop, within 30 days after the flood disaster, a comprehensive flood protection plan. The Plan must identify, analyze, and select alternative solutions to prevent a recurrence of the damages experienced in the 1982 flood. The task force was also charged with developing all requests of the Federal and state agencies for flood-related assistance.

This document is the product of Phase III. As described above, it is a comprehensive flood protection plan designed to analyze and select alternative solutions to minimize damage from floods.

Although the impact of the 1982 flood was felt throughout Allen County, the bulk of the flood's destruction occurred within Fort Wayne and the surrounding urbanized area (see Figure 1). Therefore, the goal of this plan is directed toward the Fort Wayne-Allen County urbanized area. It must be emphasized, though, that the solutions to achieve flood protection should not be limited to any geographical boundaries. The Plan consists of six sections, and a brief description of each is provided below.

The first section of the Plan is the Introduction. Its purpose is to provide a brief review of the efforts developed to recover from the 1982 flood, and to outline the remaining portions of the Plan.



Urbanized Area

FIGURE 1

Urbanized Area
City Limits

Scale Miles
0 1 2 3 4 5

The purpose of Section Two is three-fold. First, the section documents the history of flooding in the community. Floods as far back as 1828 are identified, with special emphasis placed upon ten major floods that occured from 1908 to 1982. Next, it gives a brief explanation why the rivers flood. The final purpose of Section Two is to identify the preventive measures that were proposed as a result of the previous flood protection studies.

Section Three documents the extent and the severity of the 1982 flood. The section identifies the boundaries of the primary and secondary flood impact areas and documents the public and private costs incurred in these areas. Furthermore, there were conditions present that could have made the 1982 flood more costly. Section Three identifies these conditions and projects their devastating effects had they occurred.

Section Four identifies and analyzes nine alternatives to minimize future flooding in the community. Some of the alternatives examined are dike construction and improvement, floodproofing, land acquisition and floodplain clearance, and the Trier Ditch Cut-Off. Each alternative is analyzed according to its financial and technical feasibility.

Section Five will evaluate the alternative solution or solutions. This section will also explain the process and the reasons behind the selection of the alternative to be implemented.

Section Six will identify the funding sources and agencies responsible for the implementation of the alternative selected in Section Five. In addition, the mechanism to maintain the selected projects will be discussed.

II. Summary

Since 1823, the Fort Wayne community has experienced a major flood on the average of once every five years. Each of these floods has caused extensive damage to both the public and private sector, and they have caused disruption to the community and its economic base. This problem can be resolved. Since the community can ill afford additional floods as the one in 1982, viable solutions to this problem must be identified and instituted.

Past Floods

Section Two

I. Introduction

The development of Fort Wayne began at the junction of the St. Marys, St. Joseph, and Maumee Rivers. The three rivers made the area readily accessible in a time before railroads and highways existed, and they proved to be very beneficial in the movement of commercial goods. However, the rivers became less of an asset and more of a liability as the Erie and Wabash Canal, and later the railroads, gained dominance and a growing City began to expand into flood-prone areas. By the time an adequate floodplain management program was established in the early 1970's, the Fort Wayne-Allen County community had developed about eight square miles of floodplain land with homes, businesses, and industrial buildings. It is not surprising, therefore, that Fort Wayne and the surrounding community have a lengthy history of flood disasters. This section of the Plan will document those floods. An examination of past events will provide a broader understanding of the flooding problem.

II. The History of Flooding in Fort Wayne

The documentation of past floods is conducted in two stages. Floods which occurred prior to 1908 are examined together, while those which occurred after 1908 are presented individually. The reasons for this format are that records on past floods from 1908 to the present are more detailed, and preventive measures were not addressed until the flood of 1913.

A. Floods: 1828 to 1907

As previously mentioned, there are not extensive records and data on floods which occurred in the 1800's and early 1900's. Most information on these floods is available only from old newspaper clippings and from B.J. Griswold's Pictorial History of Fort Wayne, Indiana.[1] Mr. Griswold lists in his book 15

damaging floods that occurred between 1828 and 1907 (see Table 1). There are several interesting points to note about the floods listed in Table 1. First, the floods occurred at different times of the year. For instance, eight of the floods developed during the winter months from December to March. Four floods occurred during the spring months, and three floods during the summer months. Table 1 also illustrates that the Fort Wayne community experienced two floods in the same year, in February and June of 1859.

TABLE 1[2]
Floods: 1828 to 1907

Month	Year
January	1828
July	1844
June	1858
February	1859
June	1859
April	1860
April	1861
May	1867
March	1868
February	1876
March	1883
February	1884
February	1887
April	1892
December 30	1907

B. The 1908 Flood

The first major flood of this century began March 1, 1908 with a severe ice storm which was followed by several days of rain. Before the Maumee River crested at 22.5 feet, approximately 75 homes in the city were flooded and the Fort Wayne Gas Company recorded 22 feet of water in its holder pits. Damage was extensive in the Nebraska neighborhood, and Swinney Park reportedly was completely underwater. According to published reports, water crossed Spy Run Avenue for the first time in 22 years. However, all dikes in the City held firm.[3]

C. The 1913 Flood

The worst flood in the City's history occurred in March, 1913 as a result of the most severe frontal storm ever recorded in the mid-west. The storm, which lasted from March 23 to March 27, 1913, extended from Arkansas to New York with the center of the storm located near Bellefontaine, Ohio.

By the time the worst was over, the Maumee River had crested at 26.1 feet. The Nebraska, Bloomingdale, and Spy Run neighborhoods reportedly had been under four feet of water. The Lakeside dike had broken in four places and the municipal lighting power plant was flooded. Most of the city was without electricity and all three city pumping stations were closed, leaving only the City reservoir to supply water. During this time, water was rationed and had to be boiled before use. City schools had to be closed for several days. The force of the flood water washed away much of the first pier of the Columbia Street bridge, and a thirty foot section of the Maumee River dike just east of the Columbia Street bridge was destroyed.

Before the waters finally started to recede, 5,500 private homes and businesses in the city had suffered extensive damage and six people, including four children, had died. Water had covered about 5,000 acres within the city limits and approximately 15,000 people were homeless. Total damage of the flood was $4,802,000 in 1913 dollars.[4]

D. The 1930 Flood

The next significant flood happened in January, 1930. The cause of this flood was heavy rainfall with an abrupt drop in the temperature. From January 1 to January 14, the community had rainfall totaling 5.07 inches.

The amount of rainfall was 4.05 inches above normal for that time of the year. With a drastic drop in the temperature, the river froze and large ice jams occurred. The ice jams in turn resulted in major flooding throughout the City. Families were evacuated from their homes, and areas such as Glascow, Fairmount Place, and Swinney Park were flooded. The recorded crest of the Maumee River was at 22.2 feet.[5]

E. The 1936 Flood

In 1936, an ice jam one mile long resulted in flooding in the Hamilton Avenue, Warsaw Street, Oxford Street, Pemberton Drive, Rudisill Boulevard, and Anthony Boulevard areas. After the eventual breakup of the ice flow, the Maumee River crested at 21.6 feet. Damages due to the flood were estimated at $469,600 in 1936 dollars.[6]

F. The 1943 Flood

In May, 1943, rain was once again responsible for flooding in Fort Wayne. After several days of brief, heavy thundershowers the Maumee River rose to 24 feet, its highest level since the great flood of 1913.

In the flood, about 1500 people were evacuated from their homes in the Bloomingdale, Nebraska, Riverhaven, and Spy Run neighborhoods. Several times during this flood the Lakeside dike was threatened, but with the help of 100 army engineers from Camp Thomas Scott, the dike remained secure. Damage caused by the flood water was estimated to be approximately $2,000,000 in 1943 dollars.[7]

G. The 1950 Flood

Seven years after the 1943 flood, rainfall was again responsible for extensive flooding in Fort Wayne. This flood left 125 families homeless for over a week. High water was reported primarily in the Mechanic St., Superior St., Van Buren St., Pauline St., Catalpa St., Taylor St., Freeman St., Fillmore St., South Calhoun St., Tillman Road areas and other areas surrounding the St. Marys River. The Maumee River crested at 21.5 feet, but at no time were the eastside dikes threatened. Immediately after the flood, the Board of Works appropriated funds for the building of a higher flood wall on Mechanic Street.[8]

H. The 1959 Flood

Heavy rain plus two large ice jams combined to create the flood of 1959. The major ice jam was on the St. Marys River near the Van Buren Street bridge. It was eventually broken by dynamiting, but not before 200 families were evacuated. A majority of these families were from the Waynedale area where, reportedly, two square miles were under water. Other areas under water included Swinney Park, Huron Street, and portions of the Nebraska and Bloomingdale neighborhoods. The Mechanic Street dike had to be continually rebuilt during the flood to prevent it from collapsing as the water rose. Before the worst was over, the Maumee River crested at 21.2 feet. Because of the extensive damage, President Eisenhower declared Allen County a federal disaster area.[9]

I. The 1978 Flood

A combination of rain and melting snow created the 1978 flood. Approximately 2,000 residents were evacuated from their homes as all three rivers rose far

above flood stage. The Maumee River reached 23.6 feet, 8.6 feet above flood stage before cresting. Dikes along Spy Run Creek and St. Joseph River were constantly inspected for leaks. On Spy Run Avenue, a six foot high dike had to be constructed in the middle of the street to help prevent flooding. City officials estimated that 25 miles of streets were closed by high water. According to newspaper reports, an estimated $55,000,000 in damage resulted from the flood, and Fort Wayne was again declared a disaster area.[10]

J. The 1981 Flood

In June, 1981, a series of heavy thunderstorms caused flooding in Fort Wayne. At one time during the height of the flood, the Maumee River was rising at a rate of one foot per hour. The Maumee River finally crested at 21 feet, three feet below the 1978 river level, but four feet above flood stage. Flooding was particularly heavy in the downtown and Spy Run areas. One West Jefferson Boulevard flood water was more than a foot deep. One North Clinton, near Duck Street, the pressure of run off lifted the pavement 24 feet. In addition, all the City underpasses were cut off except at Lafayette Street.

II. Understanding the Flooding Problem

The St. Marys and the St. Joseph Rivers flow into the City from the south and the north respectively. They join in the center of Fort Wayne to form the Maumee River which flows out of the City in an easterly direction. Both originate from two different areas of the Midwest and, therefore, are fed from the streams and creeks of two different watersheds (see Figure 3). Watersheds are geographical areas that drain into a primary waterway. The watershed for the St. Joseph River is around 1,100 square miles while the St. Marys watershed is about 850 square miles. Although the St. Marys River is supplied from

a smaller watershed than is the St. Joseph River, the St. Marys River usually represents a greater threat to the community as a flood hazard. During flood times, the St. Marys River usually represents well over one half of the total water flow at peak periods.

Because the St. Marys and St. Joseph Rivers are two separate entities, the Fort Wayne-Allen County community can be flooded by one or both of the rivers. The 1913 flood was caused largely by the St. Marys River while the 1982 flood was caused by both rivers. Generally speaking, the peak water flow of the St. Marys and St. Joseph Rivers do not occur at the same time. The timing of their peak flows is staggered primarily because the rivers originate from two areas of the Midwest that have different climates and weather patterns. There are times, however, when the water flow of both rivers peak at nearly the same time. Such was the case for the 1982 flood.

The potential and extent of flooding is also contingent upon weather patterns. The Fort Wayne community was fortunate in 1978 and 1982 that the heavy snow accumulations in both those years did not thaw more abruptly, or that heavy rains did not accompany the thaws. It should also be noted that floods can come from rain alone and at any time of the year and not just from melting snow in the Spring. The March 1913, May 1943, February 1950, and April 1959 floods were all caused by rain.

A better understanding of the flooding problem might be gained by also examining data on peak flow and water stages (depths) associated with previous floods. Table 2 shows these relationships for the Maumee River for selected flood events.[11]

TABLE 2
Maumee River Crests and Peak Flows

Year	Peak Flow (cfs)*	Approximate River Stage (Feet)
1913	34,000	26.1
1943	21,000	22.2
1950	19,000	21.5
1959	19,000	21.2
1978	22,000	23.6
1982	27,000	25.9

*Cubic Feet Per Second

Table 2 indicates that the 1913 flood in the Fort Wayne-Allen County area was the most severe in terms of both peak flow and river level height of the Maumee River. It is important to note that the 1982 flood, with a peak flow somewhat less than the 34,000 cubic feet per second (cfs)experienced in 1913, reached almost the same stage as the 1913 flood. Because of the extensive dike and levee construction in the area, another flood of 34,000 cfs might be expected to reach stages significantly higher than the 1913 record of 26.1 feet. Consequently, the peak flow of 34,000 cfs was chosen as a design parameter by the Army Corps of Engineers in their reports, and as a design criteria for the alternative solutions outlined later in this report.

III. Past Reports and Studies

Because of the severe flooding problem that exists in the Fort Wayne-Allen County area, every potential solution to resolve this problem must be evaluated. One purpose of this section is to identify and examine past proposals and recommendations for consideration in this Plan.

The first comprehensive flood protection plan was prepared for the Fort Wayne-Allen County area by A. W. Grosvenor, P.E., in December of 1913. Numerous

other plans and studies were developed in the years following the 1913 plan. The significant ones to be discussed are the 1943, 1959, and 1976 studies. The 1943 and 1959 studies were the result of floods that struck the community in those two years. The first was prepared by nine general contractors appointed by the mayor and the second by the U.S. Army Corps of Engineers. Stimulated by local interest, the Corps prepared the study in 1976.

Though developed over a 63 year period, the 1913, 1943, 1959, and 1976 studies have some obvious similarities. First, the studies evaluated a combination of non-structural and structural solutions. In fact, two specific alternatives were examined by all of the studies; dike construction or reconstruction, and the diversion of the St. Marys River around the City of Fort Wayne via the Trier Ditch. The second similarity between the four studies is that their recommendations were never carried out. The 1913 plan had four of its nine recommendations implemented, but only two of these recommendations were designed to reduce flood damage.

Closer examination of the 1959 and 1976 studies reveal additional information that may be of benefit to this Plan. Both studies evaluated several non-structural solutions such as flood warning and forecasting, land acquisition, flood proofing, and flood plain legislation. Only one structural solution was examined by both studies, and that was a combination of channel modification, channel diversion, and levees and flood walls.

The 1959 study estimated annual average flood losses in Fort Wayne at over $1,000,000, and it recommended that the most suitable plan to minimize these losses would be a combination scheme.[12] However, the study also determined

that the non-structural and structural solutions it evaluated were not economically feasible. With estimated costs to implement these solutions at $28,985,800, the Federal share of the project would have been $23,482,800.

The 1976 study was conducted in much the same manner as the 1959 study, but with different results. The study carried forth the recommendation of the 1959 study which was a combination scheme. The evaulation of non-structural solutions by the 1976 study found that floodproofing and permanent evacuation alternatives were not economically feasible. This is the same determination that was made in the 1959 study. It was reported that floodproofing and permanent evacuation would reduce average annual flood damage costs about $1,200,000 from an average annual damage assessment of $6,200,000. Unlike the 1959 study, however, the 1976 study determined that a combined structural solution would be feasible. It was estimated that combined structural solutions would reduce flood damage costs about $4,600,000 (figures calculated on 50 year flood intervals).[13]

The 1976 study identified floodproofing and permanent evacuation, a basic structural plan, and a limited development plan for further consideration. It should be emphasized that the study did not attempt to select a plan, but to identify some basic solutions for further study.

IV. Summary

The review of past floods has provided valuable insight for the development and implementation of a flood protection plan. Knowledge of past experiences and actions is helpful for identifying and analyzing alternative solutions to the flooding problem. Furthermore, this knowledge can be used to generate community support to foster action and institute programs.

One fact to be derived from reading this section is that the 1982 flood is not an isolated incident. The Fort Wayne-Allen County area has experienced frequent flooding. The first documented flood was in 1828. Since that time, the community has been flooded on the average of once every five years. This community will continue to be plagued by floods unless something is done to minimize their impact.

Though several studies on flood protection have been conducted in the past, few of the recommendations in these studies were ever acted upon, and the ones that were implemented were more fragmented than comprehensive. One reason that the past recommendations have not been carried through is complacency. The longer a community waits to initiate flood protection efforts, the less urgent they seem. This loss of urgency makes it harder to reach a consensus on the alternative solutions to the problems and money becomes a greater factor. Soon afterwards, the flood is forgotten. This is exemplified by a letter to the Editor of the Fort Wayne Weekly Sentinel in 1876 by the Honorable Jesse Williams. Williams wrote,

> The great flood in our rivers of February 14, 1876, so exciting at the time, is now subsiding and will soon (sic) from memory. The fact that 100 acres or more of our lowlands on the St. Marys bottom, within the City, were under water from 1 to 15 feet, will soon be forgotten like the freshets (floods) of the past.[14]

A final point that needs to be emphasized is the unpredictability of floods. Floods are capable of striking the Fort Wayne-Allen County area at most times of the year. History shows that the most severe floods have occurred in this community between the months of December and July; although, there is nothing preventing a major flood during the other months of the year. The community can also experience more than one flood in a year or even in consecutive years. Finally, the causes of floods in this community are as varied as the

months in which they can occur. Flooding can occur from either the St. Marys or the St. Joseph Rivers, or they may crest simultaneously. In addition, the overflow of the river banks can be caused by heavy or lengthy rainstorms, melting snow, ice jams, or any combination of these factors.

The Flood of 1982

Section Three

I. Introduction

The flood of 1982 placed a variety of financial burdens upon the Fort Wayne-Allen County community. For instance, the community incurred damages from the flood waters as well as from the emergency operation efforts. The private sector inquired damages to homes and businesses while the public sector experienced damages to the streets and utility systems. There was also tremendous costs incurred to battle the flood and to provide food and shelter for the evacuees. Finally, there were the intangible costs that could not be calculated.

The purpose of Section Three is to document the variety and extent of the financial burdens placed upon the community. Following the Introduction, a profile of the community's physical, social, economic, and weather patterns prior to the flood are described. Such an overview will provide a backdrop from which to evaluate the severity of the flood. Section Three also highlights the events of the emergency operations to combat the flood. This description will provide insight into the enormous time and expense required to minimize further damage to the community. Section Three then assesses the financial impact of the flood upon the community. The assessment is conducted in four phases: Emergency Operation Costs, Primary Impact Area Costs, Secondary Impact Area Costs, and Intangible Costs. Finally, Section Three examines the potential costs of the flood.

II. Environmental Setting

There is no doubt that the 1982 flood significantly affected the people of the Fort Wayne area. Before taking a detailed look at the impacts of the recent

flood, a general profile of the physical, social, and economic setting of Fort Wayne is in order. The following sections outline conditions in Fort Wayne as they existed prior to the flood of 1982. This information forms a base against which the effects of the flood and the anticipated impacts of prevention techniques can be measured.

A. Physical Aspects

1. Location

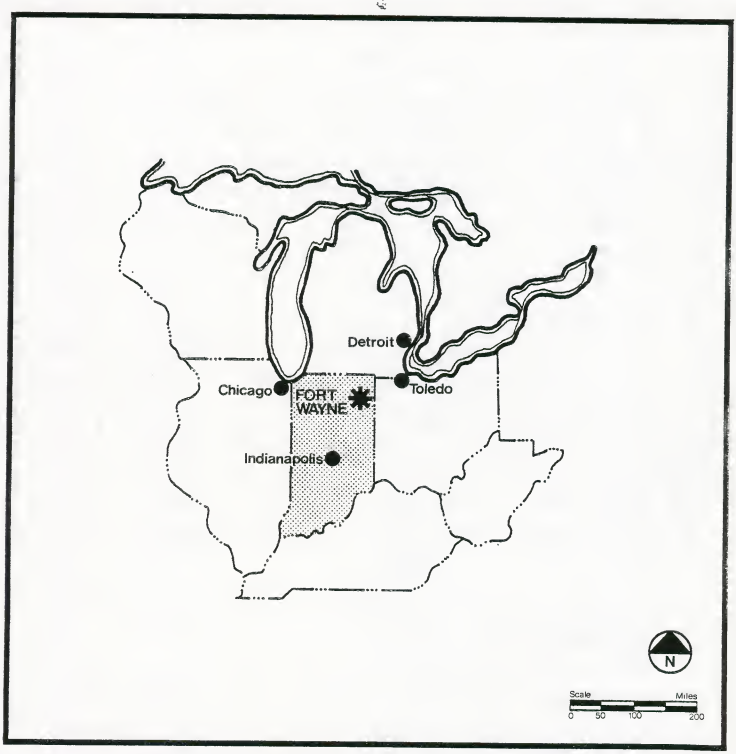
The Fort Wayne-Allen County community is located in the heart of the mid-western manufacturing belt. Its location places it nearly equidistant from the major metropolitan areas of Chicago, Detroit, and Indianapolis. Fort Wayne is the largest city and the county seat of Allen County, and serves as a regional center for northeastern Indiana, northwestern Ohio, and southcentral Michigan (see Figure 2).

2. Topography/Geology

Fort Wayne is located in a broad shallow valley marked by topography that ranges from flat plains to gently rolling hills, with an elevation variance of 75 feet. Continental glaciation, extending as far south as the Ohio River, deposited mixed gravels, sands, clays, and silts in terminal moraines that define the area's topography. These deposits of glacial drift over bedrock of dolomite and limestone make up the characteristic soil of the area. Depth to bedrock varies from 50 to 250 feet.

3. Hydrology

The Maumee River basin, in which Fort Wayne lies, is one of the largest and most important in the Great Lakes-St. Lawrence River system. The four main



Location Map

FIGURE 2

tributary streams which feed the Maumee River are the St. Joseph, the St. Marys, the Tiffin, and the Auglaize Rivers. In Fort Wayne, the St. Marys and St. Joseph join to form the headwaters of the Maumee River. The Auglaize and Tiffin Rivers join the Maumee in Defiance, Ohio. The Maumee River empties into Lake Erie at Toledo, Ohio. The Maumee basin and its relative location are shown on Figure 3.

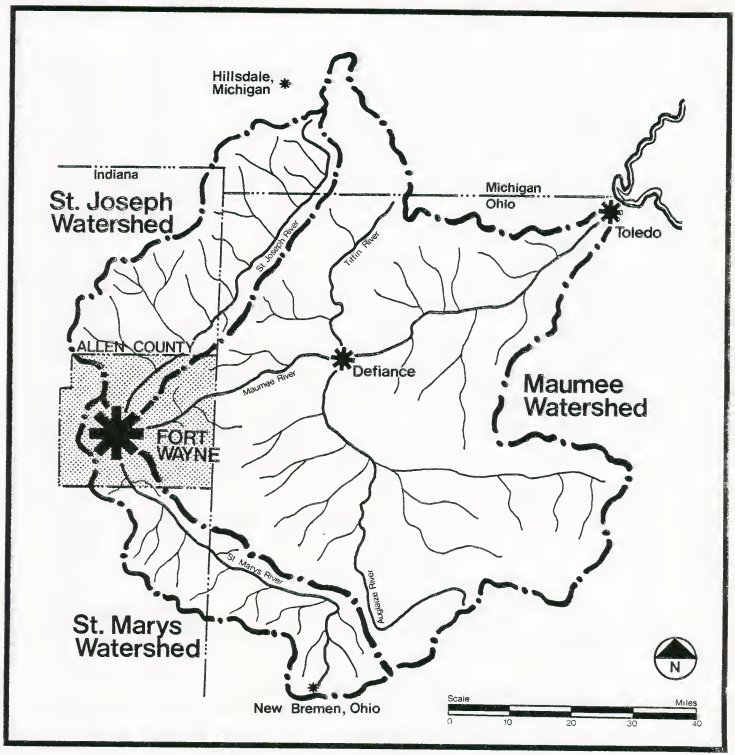
4. Climatology

The regional climate of the Fort Wayne area is representative of other midwestern areas at the same latitude, conditioned to some degree by Great Lakes influences. Precipatation averages nearly 36 inches per year with the highest monthly amounts at 4 inches in May, June, July, and the lowest monthly amount at 2 inches in February. Snow generally covers the ground for 30 days in the winter months, with heavy snowstorms being infrequent. The dates of the average last freeze and average first freeze are April 26 and October 17, respectively.[15]

B. Social Aspects

1. Population Characteristics

The population of Fort Wayne in 1980 was approximately 172,200, representing nearly 60 percent of the total population in Allen County. From 1970 to 1980, Fort Wayne's population declined by 3.4 percent, while the population of Allen County increased by 4.9 percent. The small rate of City population decline masks significant outmigration since annexation and natural ten-year increase added 14,400 and 15,620 persons, respectively.[16] When combined with a decrease in the Fort Wayne central area population of almost 17 percent, these figures suggest an increase in urbanization in the suburban areas of Fort Wayne and Allen County.



Maumee River Basin

FIGURE 3

Watershed Divide

Minority population in Fort Wayne constituted almost 17 percent of the total population in 1980. Blacks made up the largest segment of non-white population, accounting for 15 percent of the total population. Persons of Spanish origin accounted for most of the remaining minority population.[17]

2. Housing

The 1980 U.S. Census revealed that the City of Fort Wayne had almost 69,000 housing units, an increase of 12.4 percent from 1970. The majority of this increase was in renter occupied housing units, which constituted 31 percent of total units in 1970 and almost 38 percent of total units in 1980.[18]

The quality of housing in Fort Wayne is generally high. A 1979 Structural Condition Survey indicated that 87 percent of the structures were in sound condition. Approximately 11 percent of residential structures exhibited minor deterioration, 1 percent exhibited major deterioration, while less than .15 percent were considered substandard.[19]

C. Economic Characteristics

1. Employment Base

Manufacturing has been the most significant employment base for Fort Wayne and Allen County residents. Throughout Fort Wayne's history, transportation related industries have dominated the local economy: the Wabash and Erie Canal in the 1800's, the railroad in the early 1900's, and the manufacturing of automobile and truck components in the mid and late 1900's. In 1979, the Fort Wayne Chamber of Commerce reported that one-third of Allen County residents were supported by transportation related industries.

The data in Table 3 provides a breakdown of employment for the Fort Wayne Standard Metropolitan Statistical Area (SMSA) in 1979, but does not necessarily reflect current conditions.

TABLE 3
Total Employment - Fort Wayne SMSA

Type	1979 Average
Manufacturing	61,600
Durable Goods	48,500
Non Durable Goods	13,100
Non-Manufacturing	121,900
Contract Construction	8,300
Transportation, Communication & Utilities	11,500
Trade	44,900
Finance, Insurance & Real Estate	10,500
Service & Miscellaneous	28,500
Government	18,000
TOTAL	185,500

The above figures for employment sectors indicate that retail and wholesale trade are significant contributors to the local economy, with nearly one-quarter of total employment. In 1980, about 6,351 commercial establishments existed in the City of Fort Wayne.[20]

2. Unemployment Rate

The 1970's witnessed stable conditions in the Allen County economy, with unemployment rates generally below the national average. However, since 1980, the unemployment rate has risen due to a national economic recession and associated layoffs in the transportation related industries. In late 1981, the Fort Wayne Chamber of Commerce reported an unemployment rate of nearly 12 percent for the Fort Wayne SMSA.[21] Although statistics are not yet available,

the flood of 1982 probably increased the unemployment rate due to its impact on businesses and industries.

D. Snow Emergencies

To fully appreciate the economic and social setting of Fort Wayne prior to the 1982 flood, the previous winter's snow emergencies must also be mentioned. In January, 1982, four successive snowstorms gave the Fort Wayne area record snow accumulations. In two cases, the snowstorms were severe enough for a state of emergency to be declared. During these times, the City's Emergency Operations Center (EOC) remained open around the clock to coordinate emergency medical and transportation services. The City incurred significant unanticipated expenses in running the EOC and in contracting for labor and equipment to plow and remove snow from streets and public places. Consequently, the City's financial and personnel resources had been severly taxed in combating emergencies even before the flood of 1982.

In addition to emergency operations expenses, the hard winter left the City of Fort Wayne with many cracked, broken, and pot-hole filled streets. The magnitude of the street repair problem forced the City to seriously consider a bond issue to raise capital for street improvements. That bond issue is still under consideration.

E. Weather Events Preceeding the Flood

In the months preceeding the flood of March, 1982, several unusual weather events occured in the St. Joseph and St. Marys portions of the Maumee watershed that contributed to the severity of the flood. It would be overly simplistic to suggest that these events, either individually or in combination,

"caused" the flooding problem, because the dynamics of watershed runoff include many non-meteorological considerations. But the heavy winter snow accumulations, the rapid early March thaw, and the rain help explain why the flood occurred.

Between December, 1981, and mid-March, the Fort Wayne area received 71.2 inches of snow, exceeding the 1977-1978 record of 60.6 inches.[22] Because of the exceptionally cold temperatures, the snow accumulated for several months. When the snow thaw occurred, it was somewhat gradual. Had the thaw occurred during the 1.16 inch rain on March 4, the flooding that occurred could have been much worse.

Early March saw the coming of warmer temperatures to the mid-west. Under normal conditions, the more southerly St. Marys watershed will experience the spring thaw before the St. Joseph watershed. Consequently, the bulk of the moisture locked in the snow and ice in the St. Marys watershed will usually flow out of the area before the moisture in the St. Joseph watershed melts. In this case, the warm weather caused melting at the same time. The Maumee River, which normally carries one watershed's flow after the other, was subjected to two heavy flows simultaneously. The river's banks could not contain the aggregate water flow.

III. Details of the 1982 Flood

In Section Two of this Plan, it was stated that the Fort Wayne-Allen County community has a lengthy history of flooding problems. In fact the community averages one major flood every five years. Of all the floods that have occurred in this community, the flood of 1982 ranks second only to the flood of

1913 in the amount of destruction it caused. Furthermore, the flood of 1982 is the most costly to date in terms of dollars that will be needed to rehabilitate the community. The following sections illustrate the severity of the 1982 flood and present the costs incurred by the community to contain and recover from its destruction.

A. Community Action

The flood emergency of 1982 began on Friday, March 12 when the National Weather Service issued a possible flood watch. The Emergency Operations Center was set up on the ninth floor of the City-County Building to monitor the situation. This center was to remain open continuously for the duration of the flood. By 8:00 a.m. the next day, Mayor Win Moses, Jr., had issued a flood alert and initial sandbagging efforts were intensified at the City Garage. The Mayor appeared several times on local television stations and stated the urgent need for volunteers.

As the rivers continued to rise on March 14, the Mayor asked for state assistance and increased his plea for volunteers. Shortly after that, the Army and Air National Guard, a detachment of U.S. Marines, and the Indiana State Police began contributing to the flood emergency effort. In addition, the Army Corps of Engineers began to mobilize. On Monday, March 15, large numbers of City and County employees, many of whom had already been working during the weekend, began spending considerable amounts of their normal work time contributing to the flood emergency effort. By this time, several areas of the City such as the Nebraska and West Central neighborhoods, had to be evacuated. It had become apparent that Fort Wayne would suffer severe flooding and that the damage could be minimized only by a massive community effort. Thousands of

people answered the Mayor's call for sandbagging volunteers. As their numbers continued to increase, sandbagging operations had to be transferred to the Allen County Memorial Coliseum.

The sandbagging effort was conducted in several phases. Large numbers of trucks were required to haul sand to the Coliseum. After the sand was dumped, two persons, one holding open the bag and one shoveling sand into the bag, were necessary to fill each sandbag. The bags were tied by a third person and then transported, via a human chain to waiting trucks. The trucks, followed by a bus load of volunteers, were then given a police escort to sandbagging sites. Once again, a human chain was formed to unload the trucks and stack the sand bags at designated locations. All of this was supervised by an engineer. School buses and Fort Wayne Public Transportation Corporation buses were used to shuttle the volunteers to and from the Coliseum. These buses were also used during the evening of March 17th, when the decision was made to evacuate additional areas of the City. Among the areas evacuated were the North Side area, Lakeside, and the Spy Run area.

The Red Cross and the Salvation Army, already providing food, clothing, and shelter for the first evacuees, began mobilizing for the mammoth task of accomodating even more people. Ultimately, five shelters were opened and thirteen more were ready to open if needed.

The Maumee River crested at 25.93 feet on March 18, at 3:00 a.m. (EST).[23] This was only slightly below the record crest of 26.1 feet which occurred on March 26, 1913. Although the height of the floodwaters were almost identical,

the volume of the 1982 flood was less than the 1913 flood. On March 19, the Governor of Indiana requested that a major disaster be declared for Fort Wayne-Allen County. The President of the United States, who had visited Fort Wayne for a firsthand look at the flood on March 16, declared the Fort Wayne area a national disaster area on March 20.

During March 20-21, some people started returning to their homes. By this time, the bulk of expenses incurred during the flood emergency phase had occured. The community's labor and material resources would now be devoted to the clean-up and repair phase. Costs would continue to be incurred for emergency operations because some people would not be able to return to their homes immediately and would still need shelter. Local officials cautioned residents about returning to their homes, warning that it could be dangerous and to wait until City-County inspectors had certified that their homes were habitable. As it turned out, inspections by officials of the City-County Building Department determined that 81 homes were damaged to such an extent that they might require demolition. Another 246 homes were judged to require repairs that could eventually exceed their market values.[24]

B. Emergency Operation Costs

1. Public Costs

At the height of the flood emergency, it is estimated that there were more than 800 City and County employees working around the clock in 12-hour shifts.[25] Over 400 pieces of City and County equipment and automobiles were utilized in this effort. The local government's costs in labor and equipment for the emergency operations phase of the flood was more than $710,000.[26]

In spite of the performance by City and County employees, it became necessary to supplement their efforts with additional assistance. Private contractors were called to assist in the flood emergency. Materials and equipment were ordered as necessary. This was all coordinated through the City's Central Purchasing Department in conjunction with the Army Corps of Engineers. The use of outside contractors is estimated to cost the local governments over $30,000.[27]

In addition to the local costs, the State and Federal Government also joined the fight and expended considerable resources. The Army and Air National Guard provided over 8000 person hours of work, as well as trucks, four-wheel drive vehicles, buses, and helicopters at a cost of approximately $30,000.[28] The Indiana State Police provided 21 officers, each working 12-hour shifts for a five day period at the height of the flood. Their costs, which included food and lodging, were about $12,000.[29] The State and Army Corps of Engineers provided 1,035,000 sandbags at a cost of $257,775. In addition, the Corps provided tons of sand, trucks, and other flood-fighting equipment at a total estimated cost of $1,100,000.[30] The travel, labor, and subsistance budget for the Corps was approximately $100,000.[31]

2. Private Costs

An army of citizen volunteers was organized to fill and place sandbags at critical locations throughout the area to combat the rising floodwaters, with over 1,000,000 sandbags filled and 629,000 placed. In the Pemberton dike area it was estimated that 287,000 sandbags were used to reinforce this dike and save the neighborhood from flooding.[32] It is estimated that over 35,000 volunteers were utilized in the total sandbagging effort at an average of 12 hours per volunteer. If a dollar value of $4.00 per hour is used to represent

the quantitive effort of these volunteers, the labor costs of the "Sandbag Army" were $1,680,000.[33]

The American Red Cross and the Salvation Army played vital roles during the flood emergency operations. Collectively, they provided over 100,000 meals and 2,034 person shelter days.[34] In addition, they provided comfort and clean-up kits to flood victims, as well as nursing services, damage assessment information, and educational information. These material services, together with the staff and volunteer time, again quantified at $4.00 per hour, adds up to over $636,000 worth of services to Allen County during the flood.

Another cost incurred during the flood emergency was the time spent by people who were forced to evacuate their homes and apartments. Approximately 1,760 structures in the primary impact area and 2,590 in the secondary impact area were evacuated.[35] By estimating that an average of four hours was spent evacuating each structure at $4.00 per hour, the evacuation cost of the flood was almost $70,000. Of course, all of the residents in the flood area did not evacuate their homes. The residents still spent time moving furniture and possessions to upper levels of their homes.

The flood also had a profound impact upon the community's transportation system when it inundated numerous highways and forced their closing. These disruptions caused traffic congestion and created delays for local business and industry. This problem was particularly troublesome for the central business district of Fort Wayne. Traffic that enters or exits the central business district is funneled through on one of two major arterials. The two arterials, Clinton Street and Spy Run Avenue, are both one way streets. Flood

waters completely closed Clinton Street for a week and forced the 28,600 daily vehicular trips to be rerouted. Some of the traffic from Clinton Street was diverted onto Spy Run Avenue after it was converted into a two-way street. Even then, there was a frantic battle with the flood waters to keep this arterial open. On several occasions during the flood, Spy Run Avenue was also closed because of high water. Even though the street was reopened, its momentary closings caused a major disruption in the traffic system.

Lake Avenue, an important east-west arterial which handles 14,000-16,000 trips daily, was closed to traffic for several days because of a sewer back-up which created severe flooding conditions. Many streets, both downtown and in other parts of the city, were closed to traffic or were open for only limited use. Compounding these problems was a influx of traffic due to sightseers, emergency vehicles and trucks, and moving vans and other vehicles used by the evacuees. Conservatively assuming that there were 35,000 trips which suffered 10 minute delays for 5 flood days, and that each automobile carried 1.2 persons, with a value of $4.00 for each person's time, it is estimated that the flood cost the Fort Wayne-Allen County community $140,000 in lost time.[36]

TABLE 4
Summary: Emergency Operation Costs

Public Costs	
Labor and Equipment	$ 710,000
Private Contractors	30,000
Army & Air National Guard	30,000
Indiana State Police	12,000
Army Corps of Engineers	1,458,000
Subtotal	$2,240,000
Private Costs	
Volunteers (sandbag effort)	$1,680,000
American Red Cross and The Salvation Army	636,000
Evacuation	70,000
Transportation Delays	140,000
Subtotal	$2,526,000
TOTAL	$4,766,000

During the initial week of the flood emergency operations, the primary concern of the community was to minimize further damage to public and private property. However, as the flood waters subsided, this concern switched from flood prevention to clean-up and recovery. It soon became apparent that a tremendous amount of time and money would be needed to rehabilitate the areas that were flooded. After a week, many people returned to their homes and businesses and discovered foundations that were crumbling; inventories, appliances, furnaces, and electrical systems that were damaged or destroyed; warped floors; and water soaked carpets and furniture.

C. Primary Impact Areas

The purpose of this section is to determine the damage costs of the primary impact areas as a result of the flood. For the purpose of this report, primary impact areas are defined as urbanized areas in Fort Wayne and Allen

County that were adjacent to waterways and actually flooded. The primary impact areas include Nebraska, West Central, Belle Vista, Bloomingdale, Oswego, Riverhaven, and other neighborhoods. Figure 4 in the back cover of the Plan identifies these areas.

1. Public Costs

The flood of 1982 caused over $6,500,000 in damage to public property and facilities. Local government was also responsible for much of the cleanup effort after the flood. The following paragraphs provide a more detailed description of the costs associated with these conditions.

The Fort Wayne-Allen County community was confronted with a major cleanup task following the flood. The flood deposited mud and debris throughout the County. Thousands of household articles, furniture, and appliances ruined by the flood had to be disposed. In addition, temporary earthen dikes and thousands of sandbags that were placed along the rivers to save neighborhoods had to be removed. The estimated cost to local government for the removal of the mud and silt, debris, temporary dikes, sandbags, and personal property is estimated to be $554,000.

Many City and County streets, alleys, bridges, curbs, and sidewalks were damaged due to the flood. Many thoroughfares were undermined because of the rushing floodwaters. Other thoroughfares buckled due to hydrostatic pressure or were damaged due to heavy equipment. The estimated cost of this damage to the City's streets and roads is $281,000.[38] In addition, the estimated cost of street repairs in the remainder of Allen County, which includes all bridges in Fort Wayne-Allen County, is $140,000.[39]

Approximately eight miles of existing dikes and levees in Fort Wayne suffered some damage during the flood. At many locations, sandbags had to be added to the top of the dikes to insure protection. Some of the dikes, like the Pemberton dike, have suffered major structural damage. Repair costs for dikes and levees are estimated at over 800,000.[40]

The City owns three dams which were affected by the flood: the Cedarville Dam at the Cedarville Reservoir, the dam of the St. Joseph River south of the U.S. 30 Bypass at the City Utilities Park, and the Hosey Dam on the Maumee River at Anthony Boulevard. Damage to dams due to debris and high water is estimated at $50,000.[41]

Several drainage channels or open ditches were affected by the flood. Severe erosion and silting have reduced the channels' flow capacity and will require cleaning. It is estimated that two miles of channels will have to be reconstructed at a cost of $200,000.[42]

The City Utilities Water Filtration Plant, located at the confluence of the St. Marys, St. Joseph, and Maumee Rivers, falls within the floodplain area. Fortunately, the water did not rise to sufficient levels to enter the plant or disrupt the treatment and pumping of water throughout the city. The area surrounding the plant, however, was flooded and damage occurred to these grounds. Estimated damage is $20,000.[43]

The City Utilities Water Pollution Control Plant is located on the south side of the Maumee River along Dwenger Avenue and also falls within the floodplain. Flood waters surrounded the entire plant. To gain access to the facility, it

was necessary to cross water four feet deep. Through the placement of sandbags and other emergency measures, the City Utilities personnel were able to keep the floodwaters from entering the main portion of the plant. Extensive damage occurred in the aeration tanks, settling tanks, and the grounds of the Water Pollution Control Plant. On the north side of the Maumee River, immediately across from the Water Pollution Control Plant, are the City's stormwater treatment ponds which are constructed of earthen dikes. The entire area was inundated by the flood, and the high water velocities caused extensive erosion of roadways along the dike and pond areas. Continuing east on the Maumee River, located on the north side east of Lakeside Golf Course, are the Water Pollution Control Utility's sludge beds. These beds are used to dry the treated sewage and filtration plant's lime sludges. The earthen dikes, service roads, and pond cell walls were severely eroded and damaged because of the flood. Estimated costs of all the damages to the Water Pollution Control Plant, stormwater ponds, and sludge beds is $758,000.[44]

Several public buildings were flooded, including the Fire Academy on Dwenger Avenue, the Humane Shelter on Dwenger Avenue, the Old Fort, the Nebraska Neighborhood Center, the National Guard Armory, the Navel Reserve Training Center, the Nebraska Elementary School, and the Indiana-Purdue University Regional Campus. The estimated cost of the damages to these public buildings is approximately $493,000.[45]

Some city water lines were damaged due to cave-ins, main breaks caused by undermining, hydrant damage due to flood-fighting equipment, and valve damage. Estimated damages to the City water system were $13,000.[46]

The City's sewer system, which is either storm, sanitary, or combination, received major damage. At several locations, sewer lines collapsed because the ground beneath them was washed away, and many catch basins were damaged. The sanitary sewer system, particularly in the older neighborhoods where very flat sewer grades exist, will need to be cleaned to remove the heavy silt and sand deposited by the flood. The estimated cost for repair of the City's sewer system is over $4,000,000.[47]

The City owns and operates the street lighting system, as well as traffic signals and fire alarm communications systems. Damages have occurred to underground cables, as well as traffic controllers, due to flooding. The estimated cost of damage in this category is $7,000.[48]

Several of the major parks in the community were inundated during the flood, including Swinney, Lawton, Shoaff, and Foster Parks. Damage has occurred to the park buildings as well as the grounds. Golf courses, particularly at Foster Park, were damaged due to the flooding and deposit of mud and debris. Park roads, parking lots, and equipment were damaged due to the massive movement of water across the park areas. Estimated damages to the parks were $69,000.[49]

2. Quasi - Public Costs

Damage has occurred to quasi-public facilities, such as Indiana and Michigan Electric Company, General Telephone company, and Northern Indiana Public Service Company. The telephone company had their Tecumseh Avenue office flooded and required relocation of all work tasks performed at this office. The estimated cost of damages to these three utilities is $2,250,000.

3. Private Costs

A tremendous amount of damage was sustained to the homes in the primary flood area. According to estimates made by the Department of Community Development and Planning, 1,760 residential structures inhabited by 4,880 persons were in the primary flood area in Allen County. Damages to these structures is estimated to be $7,199,000. In addition, it is estimated that these homes suffered personal property and content damages of $1,955,000 (see Appendix 1: Methodology for Estimating Residential Structures and Content Damages).

Another cost is the time spent by each household in clean-up and repair activities. It is estimated that at least 20 hours per household was devoted to this task. Included in this 20 hours was time devoted to cleaning and sanitizing clothing and eating utensils; debris removal; washing and cleaning floors, walls, and furniture; making minor repairs; yard work and repairs; cleaning automobiles and small appliances; and applying for disaster assistance. These, and a host of other tasks, were performed to enable each household to return to normal. At a cost of $4.00 an hour, the clean-up time for the 1,758 residential structures is estimated to be nearly $141,000.

At least 263 business were in the primary impact area (a complete listing of these businesses is provided in Appendix 3). Costs incurred by these companies have been estimated to be $25,794,000. Included in these costs are structural and landscaping damage, content and inventory damage, clean-up costs, sales losses, and personnel time losses. A detailed account of the methodology used to ascertain this figure is contained in Appendix 2.

TABLE 5
Summary: Primary Impact Area Costs

Public Costs	
Debris Removal and Clean-up	$ 554,000
Street and Bridge Damage	421,000
Damage to Dikes	800,000
Damage to Dams	50,000
Damage to Channels	200,000
Water Filtration Plant	20,000
Water Pollution Control Plant, Sludge Beds, Stormwater Ponds	758,000
Water Lines	13,000
Sewer Lines	4,000,000
Public Buildings	493,000
Street Lighting System	7,000
Parks	69,000
Subtotal	$7,335,000
Quasi-Public Costs	
I&M, Nipsco, and GTE	$2,250,000
Private Costs	
Residential Structure Damage	$ 7,199,000
Residential Content Damage	1,955,000
Clean-up Costs	141,000
Business Losses	25,794,000
Subtotal	$35,089,000
TOTAL	$44,674,000

D. Secondary Impact Areas

For the purposes of this Plan, secondary impact areas are defined as those areas outside the primary impact area, but which suffered quantifiable physical damage as a result of the flood emergency operations. Examples of secondary impact areas are the Allen County Memorial Coliseum and the area of Berry and Begue Streets where major sewer damage occurred.

Some secondary impact areas include neighborhoods which were evacuated as a precautionary measure on March 16-17 when the Pemberton and Spy Run dikes threatened to break. These areas include the Lakeside, Spy Run, and North Side neighborhoods, and the Canterbury Green Apartments. An estimated 5,900 residents were asked to leave their homes in these areas. Specific areas evacuated are shown as secondary impact areas A, B, C, and D on Figure 4. In this section, the impacts of the flood in terms of public and private costs are described. A brief description of the secondary impact areas follows.

The Lakeside neighborhood is located immediately east of downtown Fort Wayne. The majority of the housing stock in this neighborhood is in sound condition. The Spy Run neighborhood is located immediately north of downtown Fort Wayne. This area, located next to the St. Joseph River is flooded regularly with varying severity. Although the Spy Run dike held, some water damage occurred in this neighborhood as a result of sewer backup.

The North Side neighborhood extends from North Side High School to the Parnell Avenue bridge. Canterbury Green Apartments are located up river from the North Side neighborhood near the Indiana University-Purdue University Campus. Although some water damage was experienced in these areas, it was due primarily to sewer back pressure.

1. Public Costs

Total public costs in the secondary impact areas were estimated at $1,491,000 (see Table 6). More specifically, damage to water and sewer systems was

estimated at $572,000. The majority of this damage occurred in the Lakeside, Berry/Begue, and Fairfield/Rudisill areas where repairs to storm sewers is estimated to be $507,000.[50]

A significant amount of damage occurred to streets in the secondary impact area. This damage was caused by heavy trucks and other equipment used in the emergency sandbagging and diking effort. Specific streets in the secondary area that were damaged included Griswold Avenue, Spy Run Avenue, Northside Drive, Pemberton Drive, Lake Avenue, Niagara Drive, Randallia Dr., and Edgewater Avenue. Damage to public streets in the secondary impact area have been estimated at $389,000.

One of the major headquarters for sandbagging efforts during the flood emergency was the Allen County Memorial Coliseum. Repair costs to the parking lot and buildings due to the weight of trucks and the dust from the sand is estimated to be $529,000. Damage to North Side High School and Lakeside Middle School is under $1,000.[51]

2. Private Costs

The largest private cost incurred by the residents in the secondary area was the damage resulting from sewer back up. In addition, some houses in the Spy Run area had damage from flood water. However, due to unavailability of data, no specific costs have been estimated.

Most of the businesses located in the secondary impact area are small service or office type businesses. Approximately 104 businesses are located in this

area (see Appendix 3 for a complete listing of the businesses located in the secondary impact area). Business losses include damage to structures and contents, inventory damage, lost sales, clean-up time, lost personnel time. These losses are estimated at $1,165,000 and are included in Table 6 (see Appendix 2: Methodology for Estimating Business Damage and Losses).

TABLE 6
Summary: Secondary Impact Area Costs

Public Costs	
Streets	$ 389,000
Sewer and Water Systems	572,000
Public Building/Parks	530,000
Subtotal	$1,491,000
Private Costs	
Residential Structures Damage*	--
Residential Contents Damage*	--
Business Losses	$1,165,000
Total	$2,656,000

*Estimates not provided due to unavailability of data

E. Intangible Costs

In order to estimate the true costs of the flood of 1982, it is important to recognize that there were costs to the community that cannot be calculated. It will be the purpose of this section to identify and briefly described these costs.

1. Public Costs

One cost that would be very easy to overlook could be described by the economic concept of forgone opportunities. By spending ten dollars on product A, one foregoes an opportunity to spend ten dollars on product B. Applying this concept to the flood, all of the material, labor, and dollar resources that the city ultimately expends in fighting the flood takes the same amount of resources away from regular city programs. For example, instead of installing 10 miles of new sidewalks, or repaving 50 miles of streets in 1982, only 5 miles of new sidewalks, or 30 miles of streets may be repaved because of this reallocation of resources. Therefore, the entire community bears the cost of the disaster, even though many citizens were not directly affected by the flood waters.

Another cost that is difficult to quantify is the time that many elected officials have spent dealing with the flood. As most people know, there was a Presidential visit to Fort Wayne because of the flood. In addition, the Governor has visited Fort Wayne and has devoted time and energy in dealing with the flood, as have our Senators, Congressmen, and City and County Councilmembers. Other officials have devoted and will continue to devote time to help lessen the impact of the flood.

2. Private Costs

The most significant intangible costs incurred were the three deaths that the Red Cross attributed indirectly to the flood. One death, that of a 39 year old man, occurred after the man had participated in sandbagging operations and later, while at home, suffered a heart attack.[52] The other two fatalities were described as people with chronic health conditions who's deaths were due, at least in part, to the trauma and hardships brought on by the flood.[53]

In addition to the deaths, the Red Cross reports that it treated approximately 1,100 people for injuries during the flood emergency. There were probably other injuries, aches, and pains that went unreported, or which were treated by private physicians.

The mental stress and anguish were very real costs experienced by citizens of the community. Thousands of residents were forced to evacuate their homes, leaving behind property and personal possessions for as long as a week. In addition to the worries about the safety of material possessions from the flood waters and possible looters, these people also had to worry about where to find shelter until their properties could be regained. Some chose to stay at hotels or motels, others stayed with friends or relatives, and others were forced to turn to one of the five emergency shelters. For many of these people, their stress ended when they returned to their homes and found little, if any, damage. For others finding severe damage, the worries continued.

The flood has also been responsible for a certain amount of environmental damage that is difficult to quantify. Valuable topsoil has been washed away and it is difficult to assess what kind of damage the waters, silt, and mud will

bring to plants and trees in the community. Also, the flood has brought about a considerable amount of visual pollution to the community, scattering mud, silt, trees, glass, and just about everything imaginable throughout areas alongside rivers and streams. Much of this will be cleaned up, but some of the unsightliness will be visible for months.

Business losses have already been quantified. However, there was surely a substantial loss of business productivity in the Fort Wayne-Allen County community during the days of the flood that is impossible to quantify. For example, some people were reporting late to work, other people may have had to leave work early or did not report to work at all in order to evacuate their homes. Under the tensions of the time, it was almost impossible for employees to conduct "business as usual".

Other intangible costs include, but are not limited to, pets that were lost, lost educational opportunities, social and recreational gatherings that were postponed or cancelled, possible negative images placed on affected neighborhoods, lost tax revenues associated with lower property values, and people falling victim to swindle schemes and other dishonest practices. It is gratifying to note that the latter costs appear to have been minimal in this community.

F. Potential Impacts of the 1982 Flood

From March 13-20, when many portions of Fort Wayne were experiencing serious flooding, the initial concern was for the safety of people and property in the neighborhoods first inundated. As the week continued, it became apparent that additional areas of the City were in danger of being flooded. In response to

this danger, residents in the threatened area were evacuated, and dikes were raised and reinforced. Because of this effort, and favorable weather conditions, additional flood damage to property and personal injury were averted.

A full understanding of the flood problem in Fort Wayne and Allen County requires examining what might have happened had conditions been somewhat different. The following section describes the situation in two areas of Fort Wayne that narrowly missed flooding and substantial damage and injury. The examination of solutions to minimize future flooding in the Fort Wayne-Allen County area will be incomplete if the near-flooding of the Lakeside and Spy Run neighborhoods is not considered.

For the purpose of this report, the potential impact areas will be defined as those sections of Fort Wayne-Allen County that would have been flooded had certain sequences of events occurred. These sequences of events, and their associated impacts are outlined in the following two scenarios. Each scenario begins with a brief narrative description of how the flooding might have occurred. Next, the impact on the public and private sectors is assessed and potential damages are estimated. Finally, some of the most important but intangible impacts associated with both scenarios are qualitatively described.

1. Scenario One: Inundation of Lakeside

a. The Potential Breach of the Pemberton Dike

By the evening of Tuesday, March 16, the Fort Wayne-Allen County area had experienced four days of rising floodwaters. The Maumee River poised at nearly 10 feet above its floodstage. More than 3,000 persons had evacuated their homes in the neighborhoods of Nebraska, Bloomington, Riverhaven, Waynedale, and others.

Just north and east of the confluence of the St. Joseph and St. Marys Rivers lies the inner-city neighborhood of Lakeside. The curving Maumee River forms the southern edge of this attractive older residential area. The swollen backwaters of the Maumee River had flooded the recreation fields and sewage holding ponds on the neighborhood's eastern edge. What separated the Lakeside neighborhood from the rising backwater was an earthen dike built behind the homes that faced Pemberton Avenue (see potential impact area "B" on Figure 4).

The Pemberton dike, originally built in 1913 and reinforced in 1939, is a 3000-foot long levee constructed of clay and topsoil.[54] In places, the dike rises above the surrounding ground level by 12 feet. Earlier in the week, a two foot high row of sandbags was placed on the dike's crest to effectively raise its height. However, by Tuesday, water seeping from beneath the dike forced City officials to recommend evacuation of Lakeside's nearly 3,700 residents. Fort Wayne Transportation Director Carl O'Neal described the saturated dike as having the consistency of toothpaste. In the streets around the dike, pumps worked desperately to carry away water that was fountaining from sewer manholes.

To combat the leaking dike, the sandbag placement effort was intensified. Throughout Wednesday night, dumptrucks filled with sandbags and busloads of volunteers poured into the Pemberton Avenue area. Approximately 287,000 sandbags were lifted hand to hand and placed on the top and sides of the dike. Many of the small army of volunteers at the Pemberton dike and at other emergency operations sites around the City were high school students released from their academic responsibilities to help fight the flood.

The situation at the Pemberton dike became dangerous to the point that City officials considered a controlled break of the dike. If the breach of the dike appeared imminent, it was thought that the protection of the hundreds of volunteer sandbaggers and remaining residents might necessitate releasing the Maumee's backwaters into the neighborhood. A controlled release of water into the Lakeside area would prevent the uncontrolled flash flood that would have resulted had the dike deteriorated. To quote Mayor Win Moses, Jr.:

> ...if we lose the dike...a wall of water will sweep through the area causing the destruction of hundreds of houses. We would have a flash flood the likes of which this city has never seen.[55]

Of added concern was the high pressure natural gas line running through the Pemberton dike to supply the nearby Parkview and Veterans Hospitals. A dike failure might have caused the rupture of this gas line. The resulting fires in the Lakeside area would have added significantly to the total damages from the flood event.

Obviously, the controlled break of the Pemberton dike was not required, nor did the natural failure of the dike occur. Many area residents believe the flooding of Lakeside was prevented by the monumental effort to fortify the Pemberton dike. But for the moment, consider the impact on the Lakeside area had the dike not remained intact. If the sandbags and volunteers had not arrived on the scene, if the original dike construction had not been performed properly, or if additional rain had added four inches to the Maumee River's stage, the conclusion to the Pemberton dike drama might not have been the same.

What follows is an attempt to qualify and quantify the impacts of the flooding of the Lakeside area.

b. The Extent

Had the Pemberton dike been breached, the backwaters of the Maumee would have flooded the entire Lakeside area. The area is generally bounded by Pemberton Avenue on the east, the Maumee River on the south, the St. Joseph River on the west, and a northerly line from State Street at St. Joseph River to Lake Avenue at Pemberton. Floodwaters would have entered the neighborhood to the 756 foot contour elevation, (see potential impact area "A" in Figure 4) and covered approximately 342 acres.[56]

c. The Impact

Flooding in the Lakeside area would have caused extensive physical damage and social disruption. Such an event would directly effect a population of 3,620 persons, approximately 1,508 households, and 45 commercial establishments.

(1) Emergency Operation Costs

To some extent, the inundation of the Lakeside area would require the City's emergency operation teams to take action for the immediate protection of human life. As outlined in the above section on secondary impact of the flood, the Lakeside area had already been evacuated in anticipation of the dike breach. However, additional manpower and equipment would have been required to assist those persons who did not heed the initial request, to regulate traffic around the area, to lay sandbags, etc. The dollar costs associated with these additional emergency operations are extremely difficult to quantify. However, based on emergency operations costs in primary impact areas of over $4,200,000 rough estimates may be made. If the incremental emergency operations costs under this scenario are assumed to be 25 percent of the actual incurred costs, then the total may be estimated at $1,080,000. This includes not only public

costs for City and County resources, State Police, National Guard, Army Corps of Engineers, and FEMA, but also the time given by volunteers, the Salvation Army and the Red Cross.

(2) Repair and Clean-up

The costs of repairing the damage to the Lakeside area from flooding would include those costs borne by the private sector in rehabilitation of homes and businesses, and those costs borne by the public sector in renewing the urban infrastructure and removing debris.

The Lakeside impact area contains 1,350 residential structures and 990 accessory structures. These residential buildings are generally two story (85 percent), with basement (95 percent), early 1900's vintage, and located on quiet, tree lined streets. Damages to these structures would have been approximately $16,740,000. Damage to the contents of these structures would have been $3,643,000 (see Appendix 1: Methodolgy for Estimating Residential Structure and Contents Damage).

Each flooded household would incur a certain costs resulting from time taken to clean out the dwelling. If this time is valued at $4.00 per hour, the costs for clean-up would be over $120,000.

Businesses in the Lakeside impact area are scattered within the residential areas, or clustered in small commercial nodes on arterial streets. The 45 commercial establishments in 30 buildings would have experienced structural damage, inventory damages, sales losses and lost personnel time in the amount of $1,030,000. The Lakeside impact area contains a large auto dealership that

might be expected to incur greater damages had the area flooded. Based on damages to auto dealerships in areas actually flooded, this cost might be estimated at $480,000. The total costs of damages and losses to businesses in the impact area would be $1,510,000 (see Appendix 2: Methodology for Estimating Business Damage and Losses).

Damages to public facilities under scenario one include North Side High School, Lakeside Park, streets and sewers. The North Side High School complex is located in the extreme northwestern corner of the Lakeside potential impact area. Had the floodwaters encroached, damage to the main building and its contents could have been $150,000, and to the outbuildings and grounds $50,000.[57] Two pavilion buildings and other Lakeside Park facilities would have incurred damages in the amount of $7,000.[58] Deterioration of streets and sewers from hydrostatic pressure and undercutting of supporting sub-soil would have resulted in damages of approximately $1,400,000.[59]

The presence of up to five feet of water in Lakeside homes would cause considerable damage to contents. The costs of removing debris from the flooded Lakeside neighborhood would include removing soiled and discarded personal belongings, as well as clearing away water deposited debris, temporary earthen dikes and sandbags. Debris removal costs under scenario one are estimated to be 50 percent of the debris removal costs for the entire Fort Wayne area, or approximately $150,000.

Had the Pemberton dike failed, an obvious repair cost would be the reconstruction of the dike itself. Because the dike actually did suffer extensive damages, the reconstruction costs are included in the primary impacts section,

and will not be counted here. The following Table 7 summarizes the impacts associated with scenario one.

TABLE 7
Summary: Scenario One - Potential Impact Area Costs

Population affected:	3620	
Households affected:	1510	
Residential structures affected:	1350	
Commercial establishments affected:	45	
Costs:		
Emergency Operations		$ 1,080,000
Repair and Clean-up		
Private		$22,013,000
Residential Structures	$16,740,000	
Residential Contents	3,643,000	
Clean-up	120,000	
Business Damages & Losses	1,510,000	
Public		$ 1,757,000
Northside High School	$ 200,000	
Lakeside Park	7,000	
Street & Sewers	1,400,000	
Debris Removal	150,000	
Dike Repair	0	
TOTAL		$24,850,000

2. Scenario Two: Inundation of Spy Run

a. The Potential Breach of the Griswold Dike

The St. Joseph River winds its way through the north central portion of Fort Wayne to join the St. Marys River and form the Maumee River. In the half mile before this confluence, the St. Joseph River is separated from the Spy Run neighborhood on the west by the Griswold Avenue dike. The dike and Griswold Avenue both follow the gentle westward curve in the St. Joseph River.

The Griswold Avenue dike is an earthen structure approximately 3800 feet long and ranges from 0 to 10 feet above the surface of Griswold Avenue. The dike is interrupted near its mid-point by the footings of the Tennesse Avenue bridge over the St. Joseph River. An asphalt bike trail has been constructed on the top of the dike for its entire length.

On the opposite side of the Spy Run neighborhood is Spy Run Creek. This small southerly flowing creek joins the St. Marys River a few hundred feet above its St. Joseph confluence. Another dike protects the Spy Run area from high water in the creek. This dike is approximately 3,000 feet long and rises about 5 feet over the surrounding ground level.

Early in the week of the flooding, the waters of the St. Joseph River had swollen to the point of approaching the top of the Griswold dike. Sandbags were laid along the entire length of the dike to increase its effective height. Particular attention was paid to the upstream and downstream sides of the Tennessee Avenue Bridge since those portions of the dike are lowest. In several locations along the dike, water began to seep through the saturated earthen structure. Large volumes of dirt were hauled in and thousands of sandbags were placed to fortify the Griswold dike.

The leaking Griswold dike, the leaking Spy Run dike, and sewer backwash problem generated concern for the safety of the Spy Run neighborhood residents. Consequently, City officials recommended the evacuation of the area. Pooling water behind the dikes covered several streets and residential lots, and filled many more basements.

Spy Run Avenue is part of a pair of one-way streets that form an important north-south corridor through Fort Wayne. Clinton Street, the southbound of the pair, was closed when floodwaters inundated the downtown "thumb" immediately to the south of the Spy Run area across the St. Marys River. For most of the flood emergency, water lay several inches deep on Spy Run Avenue. On occassions, the water became so deep that vehicles could not longer be driven through. During these times, Spy Run Avenue, which was converted to a two-way street when Clinton Street was submerged, was also closed. Consequently, an important transportation link to downtown was constantly threatened during the flood and would have been completely closed had the dikes failed.

Fresh water for the City of Fort Wayne is provided by the Water Filtration Plant which is located in the Spy Run impact area at the confluence of the rivers. Although the Filtration Plant suffered damage in the flood, at no time was the Plant inoperable. Uncontaminated drinking water was continually available to the entire city population. This would not have been the situation had the Griswold or Spy Run dikes failed. Floodwaters would have isolated the Filtration Plant and restricted its normal operation. More important than the actual facilities damage would have been the lack of potable water from the City's water distribution system.

Although both the Spy Run Creek and the Griswold dikes leaked while the high water was behind them, neither dike was breached by the floodwaters. Apparently, the effort to reinforce the dikes with sandbags and backfill dirt was sufficient to contain the rivers. But it is also apparent that the nearly five days of high water, or an absence of the fortification effort, would have spelled disaster for the Spy Run neighborhood. The following is an examina-

tion of the impacts that would have resulted from failure of the dikes that encircle the Spy Run area.

b. The Extent

Had the Griswold dike or the Spy Run dike failed, the entire Spy Run impact area would have been submerged. The area is bounded by the St. Joseph River on the east, the St. Marys River on the south, the Spy Run Creek on the west, and Elizabeth Street on the north (see potential impact area "B" on Figure 4). Floodwaters would have reached to a contour elevation of 756 feet, and covered an area of about 116 acres.[60]

c. The Impacts

The flooding of the Spy Run impact area would have directly effected a resident population of 1,580 persons in 770 households. Approximately 26 commercial establishments would also have been directly affected.

(1) Emergency Operations Costs

Since the Spy Run impact area had already been mostly evacuated, emergency operations related to a Griswold or Spy Run dike failure would involve evacuating remaining residents, regulating traffic around the area, preventing looting, and placing additional sandbags. The costs of this effort might be estimated at about one eighth of the emergency operations costs in primary areas, or $540,000. This figure includes private costs resulting from volunteer time and donated materials, and public costs associated with labor and materials from the City and County, State Police, National Guard, Army Corps of Engineers, and Federal Emergency Management Agency.

(2) Repair Costs

The costs of repairing flood damage to the Spy Run area would include those private sector costs associated with the rehabilitation of homes and businesses, and public sector costs associated with rebuilding the urban infrastructure.

The Spy Run impact area contains 410 residential structures, 220 accessory buildings, and 11 large apartment buildings. Approximately 83 percent of the residential structures are two story and about 87 percent have basements. A mobile home court on Spy Run Avenue near the St. Marys River bridge contains 28 mobile homes. Damages to residential structures would have been approximately $1,128,000. Damage to the contents of these structures would have been $342,000 (see Appendix 1: Methodology for Estimating Residential Structures and Contents Damage). These figures include nearly $90,000 in structural damage and $23,000 in contents damage to 11 large apartment buildings.

Each flooded household might be expected to incur a dollar cost as a result of the time devoted to cleaning their residence. If clean-up time is estimated at 20 hours per household, and that time is valued at $4.00 per hour, the total clean-up costs may be estimated at nearly $62,000.

Businesses in the Spy Run area are generally located along Spy Run Avenue and many are housed in older commercial or converted residential buildings. The 26 commercial establishments in 28 commercial buildings would have experienced over $836,000 in structural damages, inventory damages, lost sales, and lost personnel time (see Appendix 2: Methodology for Estimating Business Damages and Losses).

Floodwaters in the Spy Run neighborhood would damage public buildings and facilities including the Water Filtration Plant and the City's streets and sewers. The potential damage to streets and sewers in this area has been estimated at $600,000.[61] The Water Filtration Plant suffered damages of $20,000 due to encroaching flood waters, but would have incurred another $200,000 in facilities damaged had the dikes broken.[62]

The removal of natural debris left by receding floodwaters and destroyed personal belongings would be another significant recovery cost. Based on debris removal costs in flooded areas, the debris removal cost in the Spy Run potential impact area is estimated at 25 percent of the actual cost, or $75,000. Table 8 summarizes the impacts associated with scenario two.

TABLE 8
Summary: Scenario Two - Potential Impact Area Costs

Population affected:	1580	
Households affected:	770	
Residential Structures affected:	410	
Commercial Establishments affected:	26	
Commercial Buildings affected:	28	
Costs:		
Emergency Operations		$ 540,000
Repair and Clean-up		
Private		$2,368,000
Residential Structures	$1,128,000	
Residential Contents	342,000	
Clean-up	62,000	
Business Damages & Losses	836,000	
Public		$ 875,000
Streets and Sewers	$ 600,000	
Water Filtration Plant	200,000	
Debris Removal	75,000	
TOTAL:		$3,783,000

3. Intangible Costs

In the same manner that the flooding in the Fort Wayne-Allen County area created certain impacts, the potential flooding of the Spy Run and Lakeside neighborhoods would create the same types of intangible impacts. These intangible impacts would include, but not necessarily be limited to, the following:

-foregone investment opportunities
-time consumed by elected officials in dealing with the flood
-deaths and injuries suffered
-mental stress and anguish
-environmental deterioration
-business losses not quantified
-educational opportunities lost when schools closed
-possible negative image of effected neighborhoods
-lost tax revenue associated with lower property value
-etc.

The magnitude of the intangible impacts associated with flooding in these areas would be different, because the geographic size of the potential impact areas is somewhat smaller than the size of the actually flooded areas.

4. Conclusion

The residents of the Fort Wayne-Allen County area are fortunate that neither of these two scenarios became reality. Had either, or both of these events occurred, the flood disaster would have taken on significantly greater dimensions. Yet, local citizens must understand how dangerously close they came to witnessing a flood disaster without precedent in local history. An additional three inch rainfall in the St. Joseph or the St. Marys watersheds, the dislod-

ging of a major ice jam upstream, the loss of the supply of potable water, or the isolation of segments of the City from emergency services could have dramatically increased the number of deaths and injuries from this disaster. Only by understanding the potential but unrealized dangers of the flood of 1982, can actions to prevent the reoccurrence of flooding be fairly judged.

IV. Summary

Before the flood of 1982, the Fort Wayne-Allen County community was suffering from the effects of a national economic recession, and an unusually harsh winter. The unemployment rate of nearly 12 percent, spurred by layoffs in transportation related industries, directly or indirectly effected most of the area's citizens and industrial and commercial establishments. The record snow accumulations and record low temperatures left the Fort Wayne-Allen County area with many cracked and broken streets. The activation of the Emergency Operations Center when the snow emergencies were declared and the additional snow removal efforts left the City with unanticipated expenses. Community residents eagerly looked toward spring.

The flood emergency during the third week of March generated activity all across the County. The Emergency Operations Center was once again activated. The municipal garage and the Allen County Memorial Coliseum became staging areas for the immense sandbagging effort. Neighborhoods throughout the area were evacuated. Dikes were built and fortified. The President of the United States visited Allen County for a firsthand look and eventually declared the county a national disaster area and thousands of individuals and organizations volunteered their labor and materials to assist in the floodfighting effort.

The cost of the flood to the Fort Wayne-Allen County community includes emergency operations costs, public costs, and private costs associated with primary and secondary impact areas, and intangible costs. These costs are summarized in Table 9. The table indicates that total costs to the area were $51,403,000 plus intangible costs.

Unlike the other summary tables in Section Three, Table 9 also includes a breakdown of those dollar costs actually incurred by the Allen County and City of Fort Wayne governments. This represents nearly one fifth of the total dollar costs, or about $9,566,000. While the dollar costs are incurred by the local governments mentioned above, the real costs are to the taxpaying residents of these jurisdictions who may experience higher taxes, a lower level of public services, or an urban infrastructure in disrepair due to fiscal burdens resulting from the flood.

TABLE 9
Summary: Costs of Flood of 1982

	Total	Portion Incurred by Allen County and City of Fort Wayne
Emergency Operations		
Public	$ 2,240,000	$ 740,000
Private	2,526,000	---
Primary Impact Area		
Public	7,335,000	7,335,000
Quasi-public	2,250,000	---
Private	35,089,000	---
Secondary Impact Areas		
Public	1,491,000	1,491,000
Private	1,165,000	---
Total	$51,403,000 plus intangibles	$ 9,566,000
Potential Impact Areas		
Emergency Operations	$ 1,620,000	
Public	2,632,000	
Private	24,381,000	
Total	$28,633,000 plus intangibles	

Section Three also examined what the costs might have been had the flooding problem been worse. The two scenarios examined were the flooding of the Lakeside neighborhood resulting from a Pemberton dike breach, and flooding of the Spy Run neighborhood resulting from a Griswold dike breach. The associated costs are also indicated in Table 9. Dollar costs for emergency operations and damage repair have been estimated to have been over $28,000,000 plus intangibles. This would have pushed total damage cost due to the flood of 1982 to over $80,000,000 plus intangibles. It is obvious that the extent of private and public damage would have significantly increased had these scenarios become reality.



The 1913 flood innundated several Fort Wayne neighborhoods. Pictured is the Cass Street area immediately northwest of downtown. (Fort Wayne News-Sentinel)



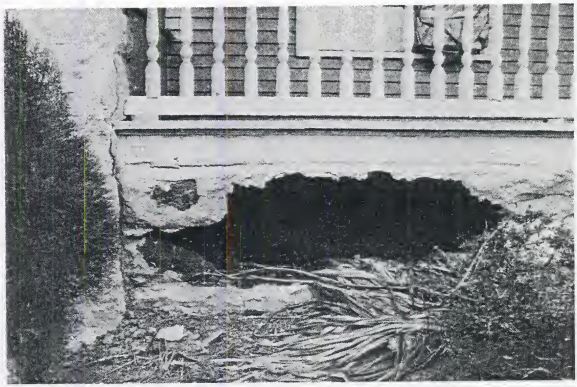
During the flooding in Fort Wayne, an ice jam developed behind the Cedarville Reservoir Dam upstream on the St. Joseph River. If the ice jam had broken loose and moved toward Fort Wayne, the flood problem would have been significantly worse. (Dean Musser, Jr./Fort Wayne Journal-Gazette)



As flood waters subsided, residents returned to their homes and the massive clean-up job. (Jeff Greene/Fort Wayne Journal-Gazette)



Collection sites along the flooded areas allowed for the quick removal of debris and damaged property during the clean-up phase. (Jeff Greene/Fort Wayne Journal-Gazette)



Physical damage to residential structures in the primary flood area was estimated to be approximately $7,200,000. Over one hundred businesses also suffered physical damage due to flooding and related causes. (Cathie Rowand/Fort Wayne Journal-Gazette)



Areas outside the actual flood area such as the Allen County Memorial Coliseum sustained related flood damage. Heavy trucks necessary for the sandbagging effort contributed to the $450,000 worth of damage to the facilities parking lots. (Carl Hartup/Fort Wayne News-Sentinel)

Alternative Solutions

Section Four

I. Introduction

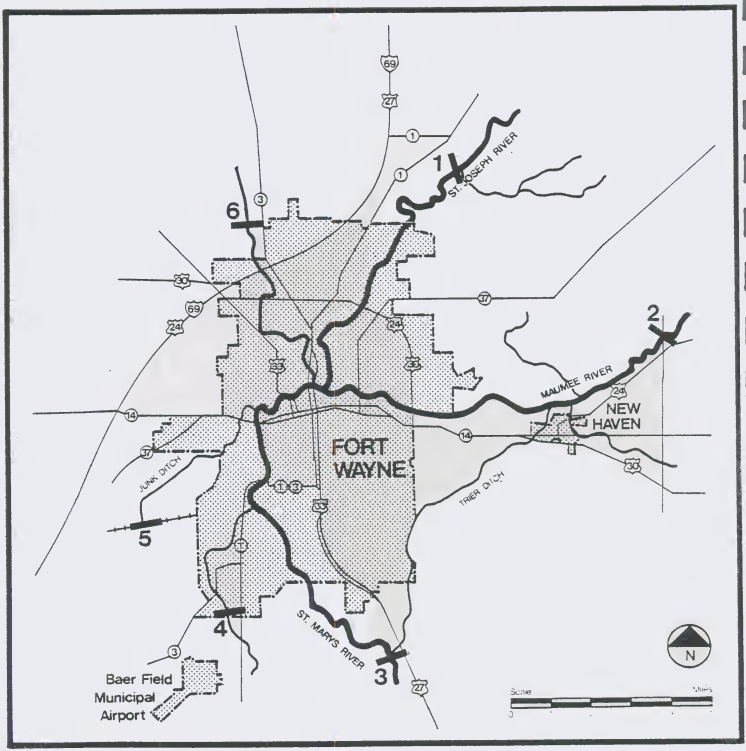
This section presents nine possible comprehensive solutions to the flooding problem, and then analyzes each of them according to their technical feasibility and cost. The section concludes with a brief summary of the alternatives with special emphasis placed upon their costs.

The process by which the nine solutions were identified and analyzed involved the participation of local, state, and Federal officials. The principal participants who developed the solutions were city and county engineers and Bonar and Associates, a private consulting firm. However, they received substantial assistance from state and Federal officials. The Indiana Department of Natural Resources (IDNR) assisted by running computer analyzes on various elements of the solutions to determine their feasibility. Furthermore, IDNR and the U.S. Army Corps of Engineers sent three representatives to Fort Wayne to aid local officials in the identification of the nine alternative solutions.

II. The Alternative Solutions

A. Study Area

The first task in evaluating alternative solutions is to identify the area in which these solutions apply. Because of the many previous studies, particularly by the Corps of Army Engineers, it was felt that the study areas should be identical. Therefore, Figure 5, the Flood Prevention Plan Study Area, is identical to that of the Corps' 1959 and 1976 reports.



Study Area

FIGURE 5

- Study Limit
  1. Tiernan Ditch
  2. Bruick Road
  3. Trier Ditch
  4. Baer Field Thruway
  5. Junk Ditch / Railroad
  6. Cook Road

B. Status of Existing Plans and Improvements

No present Corps of Engineers flood control projects have been authorized for the study area, except for the restoration of the dikes and levees which were damaged during the the March, 1982, flooding. There are no known structural flood control measures in the study area that have been undertaken by other Federal agencies. Local efforts at flood control have been made since 1913, and include levees and floodwalls along the St. Marys, St. Joseph, and Maumee Rivers in the residential areas known as Nebraska, Spy Run, Lawton Park, and Lakeside.

Recent efforts at flood control were undertaken by the City of Fort Wayne after the 1978 flood. The areas involved Spy Run Creek from Lawton Park 8,000 feet north; St. Joseph River from the Water Filtration Plant to 1,000 feet south of State Boulevard; and the St. Marys River in the Camp Allen Drive area. The work entailed repair and reconstruction, with increases in dike elevations of one to two feet along the Spy Run and St. Joseph levees. There are also low levees that have been constructed over the years along various streams in the study area. They protect against only the lowest flood stages.

Although not for the purposes of flood control, several dams have been constructed within the study area. The Hosey Dam, located on the Maumee River just upstream from the Anthony Boulevard Bridge, was constructed in 1924. Another dam, located on the St. Joseph River downstream of Coliseum Boulevard, is a part of the City water supply system. Cedarville Dam, located on the St. Joseph River, is also a part of the municipal water supply system.

C. Improvements Desired

Many residents of Fort Wayne-Allen County have expressed a desire for some type of flood control and flood damage prevention scheme that would satisfy all concerned. This was most prevalent in the recent events of the March, 1982, flood disaster.

The purpose of this section is to address these concerns by examining such flood protection measures as permanent evacuation, impoundments, additional diking and flood walls, diversion of flood flows, dredging, open space corridors, and floodplain management.

D. Technical Criteria for Evaluation of Flood Protection Alternatives

The technical criteria consists of appropriate engineering standards, regulations and guidelines, which include:

1. Alternatives which are technically feasible of implementation.

2. For purposes of this study, the design flood frequency in any one year one percent) establishes the following peak river discharges:[63]

Maumee	34,000 cfs
St. Marys	21,600 cfs
St. Joseph	15,800 cfs

3. Interior drainage facilities that provide protection against a rainfall coincident with gate closure elevations. This is of particular concern in the Nebraska, Lakeside, and Lawton Park/Spy Run areas and their respective shed areas.

4. For the alternatives involving floodproofing, structures subjected to less than two feet of flood water above the first flood would be considered for floodproofing. The structures with first floors subject to over two feet of flood water would be considered for permanent evacuation.

5. For the alternatives involving dikes and levees, in this study, top of dike design elevations were established according to the corresponding flood profiles that would result from the design flows plus two feet.

6. The Flood Insurance Administration is in the process of completing their Flood Insurance Study (F.I.S.), and their data is not "officially" available. However, their data is not expected to exceed the criteria established in paragraphs 2 and 5 above.

7. It must be emphasized that the alternatives in this report are based upon conceptual plans. Any further development of one of these or a combination of these alternatives must include full consideration of the possibilities of design of multi-use facilities, expecially in the area of recreational use.

   Any further development of flood protection by dikes and the corresponding improvements to pumping stations must be made compatible with the ongoing City of Fort Wayne Combined Sewer Overflow Study.

8. The Riverhaven area was found to be difficult to evaluate in developing flood control solutions. Further review of either structural or flood control measures for the Riverhaven area must be made during future project development phases.

E. Alternative Solutions for a Flood Control Prevention Plan

As mentioned earlier, this plan presents nine alternatives that, alone or in concert, will minimize or eliminate the degree of flooding which occurs in Fort Wayne and its vicinity. The alternative plans are as follows:

1. Construct a Trier Ditch Cut-Off that will carry 80 percent of the design flood volume of the St. Marys, and increase the Maumee River cross section downstream from New Haven. Dredge the St. Joseph River in accordance with the 1959/1976 Corps report. Upgrade and expand, as necessary, the internal storm and relief sewer systems, including pump stations, to adequately drain the areas behind the protective dikes and levees. No permanent acquisition or evacuations would be part of this alternative.

2. Implementation and construction of the Corps of Army Engineers 1959/1976 Flood Prevention and Protection Plans. This includes a Trier Ditch Cut-Off that will carry 40 percent of the design flood volume of the St. Marys River; an increase of the Maumee River's cross section downstream from New Haven; and levee improvements and construction, floodproofing and dredging in the urbanized area. No permanent evacuation or acquisition would be included in this alternative.

3. The total evacuation and acquisition of all flooded or potentially flooded areas within the design flood area. This would include the relocation

of all families and businesses, and the demolition of all structures within the designated area. This land would be designated open space for park and recreational type uses.

4. Construct the Trier Ditch Cut-Off that will carry 40 percent of the St. Marys River, and dredge the St. Joseph River as in Alternative 2. Construct dikes and levees as necessary to protect the projected design flood river stages, including internal drainage improvement. In addition, effect a limited amount of permanent evacuation in the following areas:

    a. Downtown "thumb" (that flooded in 1982)
    b. Michael/Ross Street
    c. Riverhaven
    d. Fairmount Place

5. Provide for the construction of upstream impoundments for storage on the St. Joseph and St. Marys watersheds.

6. Floodproof all structures subject to less than two feet of flood water at ground level. All structures within the designated flood area that could not be floodproofed would be evacuated and the area cleared for open space usage.

7. Provide for the improvement of the three rivers' cross sections and profiles to accomodate the peak discharges.

8. Construction of a St. Joseph River Cut-Off beginning at the Cedarville Reservoir and draining southeasterly to the Maumee and the Trier Ditch Cut-Off as per Alternative 4. The Maumee River would have to be dredged

to adequately accept these flows at their confluence, as well as for a limited length downstream.

9. Provide protection by increasing the height and length of existing dikes and levees, providing new dikes where necessary, and construction or modification of pumping stations and appurtenances for internal drainage.

F. Analysis of Alternatives

1. Alternative 1 — Trier Ditch Cut-Off (80 percent Diversion) and Dredge St. Joseph River as per 1959/76 Corps Report

The Trier/Paul Trier Ditch is a small drainage ditch leading in either direction from the "summit" of the divide between the St. Marys and the Maumee River watersheds. The summit of the Trier Ditch is located approximately 13,000 feet from the St. Marys River and 36,700 feet from the Maumee River at New Haven. The total length of the Trier/Paul-Trier Ditch is approximately 9.4 miles.

This divide between the St. Marys and the Maumee River watersheds is about 7.5 miles southwest of Fort Wayne. The summit is at such an elevation that water will not cross the summit until dangerous stages are recorded on the St. Marys River in Fort Wayne. The elevation of the summit is approximately 765.50.

Under the implementation of a "Trier Ditch Cut-Off", a new drainage course would be constructed along the path of the Trier/Paul Trier Ditch (see Figure 6). This new drainage course would be large enough to allow large portions of the St. Marys River floodwater flows to bypass the City of Fort Wayne. The obvious impact of a Trier Ditch Cut-Off will be to reduce the floodwater stage levels throughout the St. Marys River through Fort Wayne.

Because of the size of the drainage course that will be necessary to effectively relieve floodwater flows down the St. Marys River, all of the present crossings of the Trier/Paul Trier Ditch will require improvements. There are 11 road crossings, 3 State Highway bridges, and 3 railroad bridges which must be modified and replaced. In addition to these, there are 7 farm crossings.

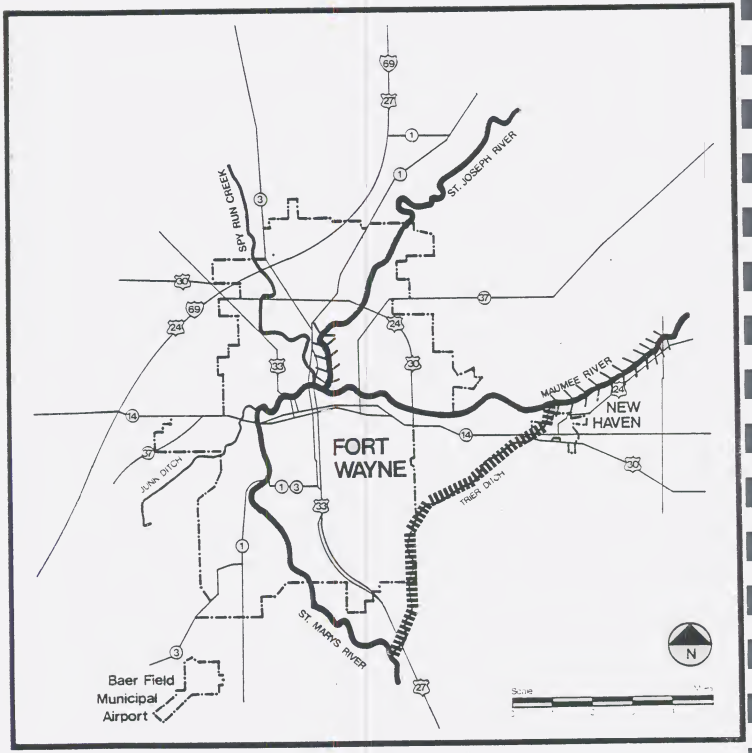


FIGURE 6

Alternative 1

Trier Ditch Cut-Off and St. Joseph River Channel Improvements

IIIII Trier Ditch Cut-Off (80%)

\\\\\ Channel Improvements

The following is a list of the bridges considered:

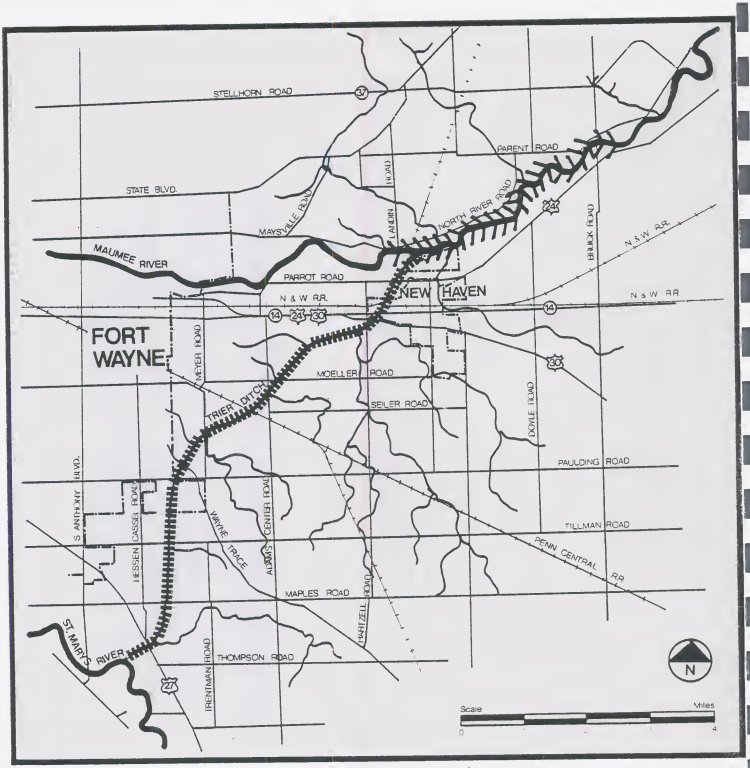
Railroad
Penn Central (1)
Norfolk & Western (2)

Highway
U.S. 27
Maples Road
Tillman Road
Paulding Road
Wayne Trace
Meyer Road
U.S. 30
U.S. 24
Clement Street
Parrott Road
Landin Road

Some form of the Trier Ditch Cut-Off has been considered as a viable alternative for flood control for this area ever since 1913. Allen County officials have recognized this and, through the efforts of the Plan Commission and the Drainage Board, have restricted development along the path of the proposed Trier Ditch Cut-Off.

In 1959, a report was prepared and plans were drawn by the Detroit District of the Army Corps of Engineers for improvements to the Maumee, St. Joseph and St. Marys Rivers. In 1976, the report and the estimated costs were updated. Alternative 1 adopts and updates the proposals made in the Army Corps Report for the proposed dredging improvements to the St. Joseph River (see Table 9).

The 1959/1976 Corps report and plans also detail the proposed Trier Ditch Cut-Off. The 1959 plans are based upon a 40 percent diversion (10,000 cfs) down the Trier Ditch Cut-Off. A close examination of these plans reveals that after modifying the channel width and depth, it appears the Trier Ditch Cut-Off capacity could be increased to approximately 80 percent. This increased capacity cannot be gained, however, without the widening of the banks and the corresponding cost increases that would be associated with the widening. These increased costs would be incurred because of more land acquisition, longer bridges, larger volumes of earth to move and spoil, and large diversion



Trier Ditch Cut-Off

FIGURE 7

IIIII Trier Ditch Cut-Off
⟩⟩ Channel Improvements

and control structure. The cost for the Trier Ditch Cut-Off (80 percent diversion) is shown in Table 10.

The construction of a Trier Ditch Cut-Off is believed to be one of the most viable alternatives being considered due, in particular, to the volume of river flow which can be diverted away from Fort Wayne. Two options regarding the size of the Trier Ditch Cut-Off are presented. Alternative 1 presents the 80 percent diversion. Alternatives 2 and 4 present the 40 percent diversion.

The area known as Riverhaven, located between Fort Wayne and New Haven, has been frequently subjected to the flooding of the Maumee River. It is proposed under this alternative to protect the Riverhaven area by perimeter diking along the South River Road from Parrot Road east to the extension of the Riverhaven area and back to Parrot Road. Because of such diking, the internal drainage or surface runoff will require pumping.

In summary, this alternative proposes diversion of 80 percent of the design flood flow volume from the St. Marys River through a Trier Ditch Cut-Off to the Maumee River. This would require increasing the Maumee River cross section downstream from the confluence of the Trier Ditch Cut-Off for approximately 4.5 miles. Approximately 17,000 cubic feet per second (cfs) of the design flood flow volume of 21,600 cfs would be diverted under this alternative. This alternative also includes dredging of the St. Joseph River as per the 1959/76 Corps report, as well as protecting Riverhaven.

TABLE 10
Summary of Costs: Alternative 1

Description	Trier Ditch Cut-Off (80 percent Diversion)	St. Joseph River	Total
Channels including clearing	$19,292,000	$1,210,000	$20,502,000
Maumee River channel increase downstream of Trier Ditch	4,000,000	None	4,000,000
Levees and floodwalls improvements	None	220,000	220,000
Floodgate and sewer improvements on St. Joseph River	None	1,000,000	1,000,000
Diversion & floodway control structures	10,881,000	None	10,881,000
Railroad bridges	10,335,000	None	10,335,000
Land, easements & R/W	9,009,000	274,000	9,283,000
Relocations:			
Roads & Highway Bridges	18,248,000	None	18,248,000
Dwellings	1,200,000	None	1,200,000
Utilities & Contingencies	9,774,000	405,000	10,179,000
Engineering & Design	6,619,000	249,000	6,868,000
Supervision & Administration	5,792,000	218,000	6,010,000
Sub-Totals	$95,150,000	$3,576,000	$98,726,000
Riverhaven Area			
Diking & levee protection			$ 1,100,000
Land, easement & R/W			186,200
Roads & drainage crossings			1,750,000
Internal drainage improvements			1,550,000
Internal pump station			1,800,000
Contingencies			949,300
Engineering & design			690,400
Supervision & administration			604,100
	Subtotal		$8,630,000
		TOTAL	$107,356,000

2. Alternative 2 1959/1976 Corps of Engineers Plan

This alternative is basically an updating of the cost estimates for the Structural Measure Alternative which was presented in the Preliminary Feasibility Report for Flood Control (June, 1976), U.S. Army Corps of Engineers, Detroit District. The Structural Measure includes a combination of channel modification, levees and floodwalls, and floodwater diversion.

In 1959, investigations were conducted which found the most suitable plan to alleviate flood losses in Fort Wayne and vicinity was a combination of channel modifications, levees and floodwalls, and floodwater diversion. At that time, the plan was designed to provide overall protection against flows somewhat greater than the 1913 flood.

In 1976, the Corps updated its original 1959 report. In the update, the degree of overall protection was reduced to provide for a 100-year frequency flood, or a 1 percent chance of occurring in one year.

As depicted in Figure 8, Alternative 2 consists of the following:

a. Channel modification of the Maumee, St. Marys, and St. Joseph Rivers so that 100-year flow capacities can be obtained at lower river stages than are presently possible.

b. Excavation of a diversion channel from the St. Marys to the Maumee River in order to divert a part of the St. Marys River flow around the City of Fort Wayne. This is commonly referred to as the Trier Ditch Cut-Off and would divert approximately 10,000 cfs, or 40 percent of the 100 year flood flow.

This project involved the expansion or replacement of several railroad, roadway and highway bridges. These bridges were listed in Alternative 1. The 1959/76 plans also call for the elimination of the Hartzell Road Bridge by relocating a portion of the Hartzell Road around the proposed Trier Ditch Cut-Off.

c. Construction of levees and floodwalls on Spy Run Creek, St. Marys and St. Joseph Rivers, which will permit river levels to be held within non-damaging limits insofar as is possible. Included would be the necessary interior drainage facilities in order to prevent flooding behind the levees and floodwalls.

The interior drainage facilities and interceptors that would require improvements due to the levees and floodwalls involve outfalls located along:

Spy Run	Third Street
Barr Street	Main Street
Harrison Street	Junk Ditch
Fairfield Avenue	Rolling Mill
Van Buren Street	Carlton Avenue
Nelson Street	Gruber Avenue

Also involved are new stations or modifications to existing high level relief stations at:

Spy Run	Fairfield Avenue
Third Street	Nelson Street
Junk Ditch	Wildwood
Harrison Street	

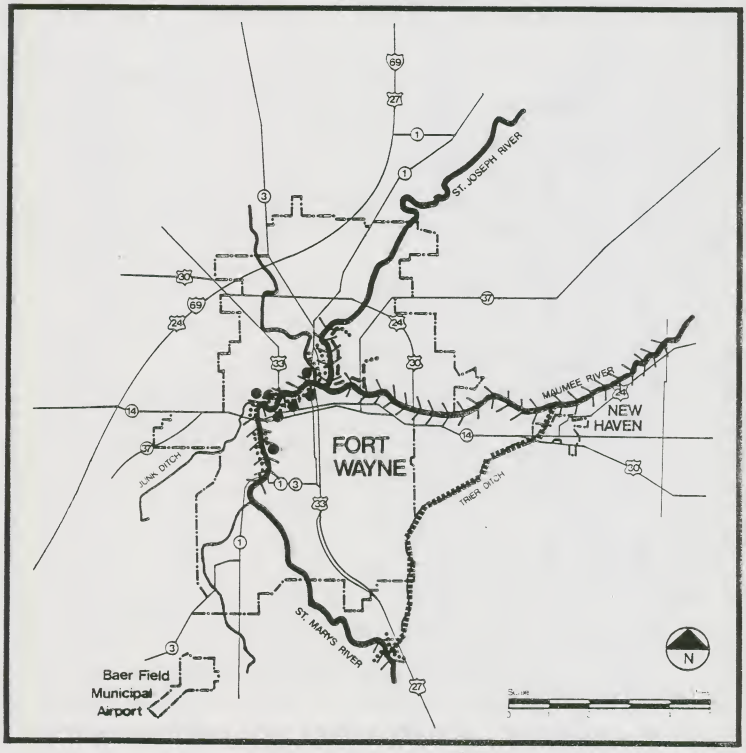
The 1976 costs from the Preliminary Feasibility Report for Flood Control (June, 1976), U.S. Army Corps of Engineers, Detroit District were adjus-

ted to 1982 price levels by using the Engineering News Record Construction Cost Index of May, 1976 (2,327.7) and March 18, 1982 (3,729.17). The summary of costs for Alternative 2 is shown in the following table.

TABLE 11
Summary of Costs: Alternative 2

Description	Maumee River	St. Joseph River	St. Marys River and Spy Run Creek	Trier Ditch Cut-Off 40 percent	Total
Channels including clearing	$23,805,000*	$1,210,000	$5,253,000	$ 9,010,000	$39,278,000
Levees and floodwalls	29,000	220,000	6,639,000	None	6,888,000
Diversion & floodway control structures	None	None	None	8,370,000	8,370,000
Pump Stations & Internal Drainage Improvements	None	None	32,122,000	None	32,112,000
Railroad Bridges	None	None	None	7,950,000	7,950,000
Lands, Easements & R/W	2,060,000	274,000	1,495,000	7,590,000	11,419,000
Relocations:					
Roads & Highway Bridges	207,000	None	None	13,830,000	14,037,000
Dwellings	None	None	916,000	1,050,000	1,966,000
Utilities & Contingencies	214,000	None	511,000	2,460,000	3,185,000
Engineering & Design	2,107,000	146,000	3,754,000	4,020,000	10,027,000
Supervision & Administration	1,842,000	119,000	3,285,000	3,520,000	8,766,000
Sub-Total	30,264,000	1,969,000	53,965,000	57,800,000	143,998,000
Riverhaven (See Alt. 1)	8,630,000				8,630,000
				TOTAL	$152,628,000

*Includes channel work required on Maumee River associated with the Trier Ditch Cut-Off



Alternative 2

FIGURE 8

1959/76 U.S. Corps of Engineers Plan

- — — Existing Levee
- ● Proposed Pumping Stations
- • • • Proposed Levees and Floodwalls
- 〉 Channel Improvements
- ▪▪▪▪▪ Trier Ditch Cut-Off (40%)

3. Alternative 3 Total Permanent Evacuation of All Flooded Areas

a. Land Use Changes - Permanent evacuation of all flooded areas

This alternative includes the acquisition, relocation, and demolition of all properties and structures within the flood area. In developing these estimates, certain assumptions were made and formulas developed to estimate the costs for total evacuation and clearance of the flooded areas. This analysis was divided into 14 priority study areas plus the balance of the flood area (see Table 12).

b. Methodology of Estimates

Since the flood areas were so large, certain generalizations and assumptions had to be made to develop average cost figures and formulas. The following paragraph describes the methods for making the acquisition, demolition, and relocation estimates.

(1) Acquisition

In making the estimates for acquisition, two formulas were used: one for residential structures and one for commercial/industrial structures.

Residential estimates were made on a neighborhood basis where possible. Current sale prices and appraisals of homes were used to develop these average acquisition costs. The total number of homes was counted by map sheet, neighborhood area and in some cases, by sub-area and the average price per unit was multiplied by these numbers to get total acquisition costs. For example, the average estimated price of a home in the Vesey Avenue area was $21,000, and the total number of homes counted was 78, resulting in an acquisition costs of (78 x $21,000) or $2,340,000.

In arriving at the counts of residential units, base maps displaying structures, aerial photographs, city directories, and local officials were used.

Commercial/industrial estimates were based on a formula generated from the past experience of the Fort Wayne Redevelopment Commission. The formula is the assessment value of the land and improvements times a multiplier. Tax assessment records were used in nearly all cases. In those cases where the tax assessment of the property was not available, a figure was derived from examples of similar properties and uses.

(2) Demolition

Estimates for the demolition of a housing unit was based on $1,500 per unit and $200 per outbuilding.

Estimates for commercial and industrial structures were based on a figure of 12 cents per cubic foot. This figure was based on past demolition costs observed by the Redevelopment Commission.

(3) Relocation

Relocation costs were based on the assumption that the Uniform Relocation Act would be followed. Using this act as the guideline, estimates were once again made on a neighborhood basis.

For relocation of residential areas, the following guidelines were used:

(a) Up to $15,000 was allowed for replacement housing for homeowners depending on the neighborhood. Replacement costs ranged from $0 to $6,000

average per neighborhood, depending on the value, size, and condition of the housing.

(b) Renters were allowed up to $4,000 replacement cost.

(c) Moving expenses and legal fees were estimated at $1,700 per housing unit.

Commercial and industrial areas were harder to estimate since their size, contents, and type of use varies considerably. In developing a standard for this, the Redevelopment Commission's staff was consulted. Looking at areas and businesses previously relocated, costs were developed for similar businesses and properties in the flood areas. It was estimated that relocation costs for commercial and industrial businesses would range from $25,000 to $100,000. Very large industries would be substantially higher. Each commercial or industrial property identified was estimated individually based on relocation costs of similar businesses.

(4) Lakeside/Spy Run Creek Areas

A detailed analysis was made for all areas flooded in 1982. Since the Lakeside and Spy Run Creek areas came very close to flooding and are within the 100-year flood area, estimates have also been made for these areas.

The preceeding information considers only acquisition, relocation, and demolition activities within the flood area. Other considerations to be addressed are the costs of landscaping of the cleared areas, the cost for the removal of the paved roadways, sidewalks, and utilities, and the loss of tax revenues. These costs are examined in the following paragraphs.

(5) Removal and Restoration of Cleared Flood Areas

Once the homes and businesses have been acquired and relocated and all structures demolished, the vacant land will need to be converted to open space. This conversion would include the removal of paved streets, sidewalks, street lights, and removal or abandonment of utilities. For the purpose of this study, cost estimates were prepared for the removal and restoration of all developed areas within the flood limits.

The estimates were based on the following cost breakdown as determined by Ron Bonar and Associates.

Street and driveway approach removal	$7.00 per square yard
Sidewalk removal	$4.00 per square yard
Street light fixture removal	$100.00 per fixture
Utility removal or abandonment	$20.00 per linear foot
Restoration (seeding & grading)	$1.00 per square foot

Using a typical city block as an example, these estimates were incorporated into a $15,000 per acre rate. The estimated cost for the conversion of approximately 1,600 acres to open space will be $23,662,000.

(6) Loss of Tax Revenue

The loss of property tax revenues in Alternative 3 was based on an average assessment for each property by neighborhood areas. The tax assessment figure was then multiplied times the tax rate for the township district of these neighborhoods or areas. This figure was reduced by 20 percent to get the tax rate assessed for each property by the township taxing district. This 20 percent reduction is standard throughout the state. An example of the formula used for Wayne Township Taxing District 29 is:

(Gross assessment value - mortgage exemption) divided by 100 x 8.779 x .8 = Tax Revenue

The estimated loss of property tax revenue is $3,460,000. The 20 percent reduction is reimbursed through the Indiana Property Tax Relief Fund. The total revenue loss, therefore, is increased by $692,000 to $4,152,000.

TABLE 12
Summary of Costs: Alternative 3

Map Reference Number	Areas	Acquisition-Relocation-Demolition
4	*Thumb Area	$ 12,639,400
6	Michael St./Ross St.	3,521,800
12	Riverhaven Area	2,798,500
9	Vesey Avenue Area	2,856,000
7	Nebraska Area	15,884,300
10	Belle Vista/Allendale Area	7,015,000
4	Fairmount Place Area	2,042,400
5	Herman/Sherman Street Area	4,354,800
3	Eastbrook/Westbrook Area	1,142,000
2	Oswego Area	1,718,200
19	Tillman Road Area	2,465,200
	Winchester Road Area	1,659,200
B	Lakeside Area	79,300,000
A	Spy Run Area	19,482,000
	Other Flooded Areas	48,478,600
	Subtotal	$205,358,000
Conversion of above areas to open spaces (See Removal & Restoration section of this alternative)		23,662,000
	**TOTAL	$229,020,000

*Thumb area in this alternative is bounded by the St. Marys River on the north, the McCulloch Street Bridge on the west, Superior Street on the south, and Spy Run Avenue on the east, excluding the new County Jail, Wayne Township Assessor's Office, Hall's Gas House & the Armory.

**Total cost does not include lost property tax revenue from the areas once they are evacuated.

4. Alternative 4 Trier Ditch Cut-Off (40% Diversion), Dredge St. Joseph River as per 1959/76 Corps Report, Improve Dikes & Levees, and Effect Limited Evacuation in Specific Areas.

This alternative proposes diversion of 40 percent, or 10,000 cfs, of the design flood flow volume from the St. Marys River through the Trier Ditch Cut-Off to the Maumee River. This diversion follows, in general, the 1959/76 Corps plan as well as the improvements recommended along the St. Joseph River. Also included in this alternative is a degree of channel improvement along the Maumee downstream of the cut-off confluence.

With the help of the U.S. Army Corps of Engineers, Detroit District, and the Indiana Department of Natural Resources, computer modeling was utilized to predict the river stages that would be anticipated for the flow rates on the three rivers. The modeling was done for this alternative as well as the 80 percent diversion in Alternative 1. The modelled flood stages were used to determine the degree of diking, levee protection and internal drainage improvements under this plan in the same manner as Alternative 1. The amount of internal pumping and drainage work is higher in this alternative than in 1 but less than that of Alternative 2.

Under this proposal, four areas are included for evacuation/relocation. They are the "thumb" which is bounded on the west, north, and east by the St. Marys River and on the south by Clair Street, the Armory, and Duck Street; the Michael/ Ross area which is bounded on the south and west by the N&W Railroad and on the north by the St. Marys River; and on the east by Fairfield Avenue and the Fairmount Place area. The final area considered for evacuation/relocation is Riverhaven.

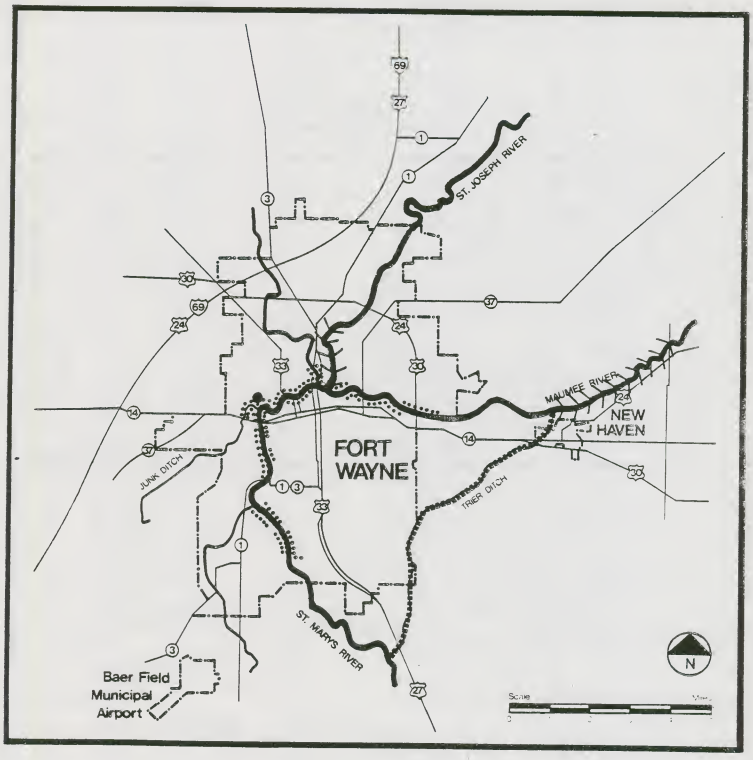
A breakdown and summary of the costs associated with this alternative are presented in Tables 13 and 14.

With the exception of Fairmount Place, the acquisitions suggested in Alternativer 4 are only tentative. Furthermore, the acquisition of these areas is not a priority because other flood protection measures are more cost-effective. It should also be noted that the possible acquisition of these areas will limit, but not necessarily preclude, all future development.

TABLE 13

Maumee, St. Joseph, and St. Marys Rivers and Spy Run Creek Improvements

Description	Maumee River	St. Joseph River	St. Marys River and Junk Ditch	Spy Run Creek	Total
Channels, including clearing	$4,000,000	$1,210,000	None	None	$ 5,210,000
Levee & floodwall improvements	678,000	711,000	$ 2,991,000	$ 750,000	5,130,000
Diversion & flooway control structures	None	None	None	None	None
Pump stations including internal drainage improvements	None	1,000,000	22,017,000	None	23,017,000
Lands, Easements, and R/W	317,000	459,000	831,000	193,000	1,800,000
Contingencies	749,000	507,000	3,876,000	141,000	5,273,000
Engineering & Design	460,000	311,000	2,377,000	87,000	3,235,000
Supervision & Administration	402,000	272,000	2,080,000	76,000	2,830,000
TOTALS	$6,606,000	$4,470,000	$34,172,000	$1,247,000	$46,495,000



Alternative 4

FIGURE 9

Combination of Solutions

- ● Proposed Pumping Stations
- ••• Proposed Levees and Floodwalls
- 〉 Channel Improvements
- ▪▪▪▪ Trier Ditch Cut-Off (40%)

TABLE 14
Summary of Costs: Alternative 4

Trier Ditch Cut-Off (40% Diversion)		$ 57,800,000
Maumee, St. Joseph & St. Marys Rivers and Spy Run Creek Improvements		46,495,000
Permanent Evacuation (including acquisition, demolition, relocation, and conversion to open space)		
*Thumb Area	$6,641,000	
Michael/Ross St.	3,767,000	
Riverhaven	3,833,000	
Fairmount Place	945,000	
Subtotal	$15,006,000	15,006,000
TOTAL		$119,301,000

*Thumb area in this alternative bounded on the west, north, and east by the St. Marys River and on the south by Clair Street, the Armory, and Duck Street.

5. Alternative 5 — Upstream Impoundments on the Various Rivers and Tributaries.

The basis of this alternative is to construct dams or impoundments in order to reduce the water elevations through Fort Wayne. However, this concept will not be easy to implement because there is not much topographical relief within the St. Marys and St. Joseph River shed areas. Because of this lack of relief, the areas of impoundments would be vast, as well as many, requiring the acquisition of several square miles of prime agricultural and wooded areas.

The Corps of Engineers, in their 1959 report, provided a detailed analysis of the number and size of impoundments that would be required. Table 15 taken from the Corps' report, lists the tributary affected and the size of the required impoundment.

The preliminary cost for such a reservoir plan was estimated at $43,806,000 in 1959. To bring this to a 1982 construction cost base, the change in the Engineering News Record Construction Cost Index was used. The construction cost index in March 1959 was (781.4); in March of 1982 (3,729.17). This is an increase by a factor of 4.77. Therefore, the 1959 dollars represent a 1982 cost of $208,954,620.

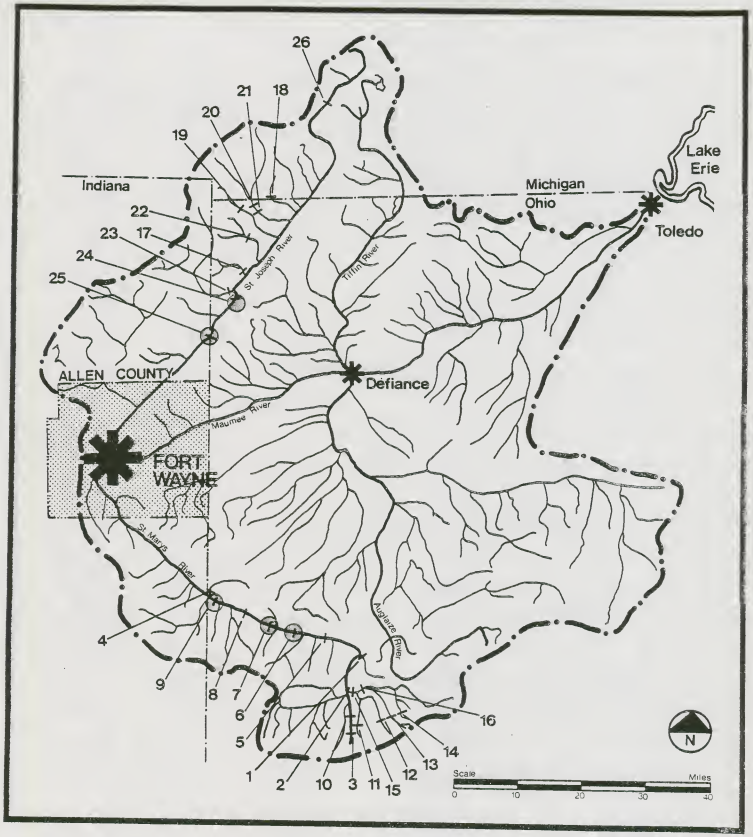
It should be noted that the most desirable locations for the dam and reservoir sites are in the state of Ohio. This will cause some jurisdictional problems because the work is done in Ohio while the primary benefit is received by the residents of Indiana.

TABLE 15
Potential Reservoir Sites

Dam Site	Tributary	Height of Dam (Feet)	Acre Feet	Inches of Run-off	Drainage Area Square Mile	Percent Basin Area Controlled
	St. Marys River Watershed					
1	Six Mile Creek	24	6,890	9.02	14.2	1.9
2	East Brank	24	10,740	2.87	69.7	9.3
3	Main Stem	27	3,560	3.41	19.4	2.6
4	Prairie Creek	27	10,250	7.97	23.9	3.2
5	Main Stem	15	10,565	0.67	292.2	38.8
*6	Main Stem	21	34,440	1.76	364.1	48.4
*7	Main Stem	20	52,190	2.37	409.4	54.4
8	Main Stem	12	10,620	0.48	412.5	54.8
*9	Main Stem	21	34,760	1.30	498.4	66.2
10	Main Stem	20	1,930	1.59	22.5	3.0
11	Carter Creek	24	1,930	4.32	8.3	1.1
12	Center Branch	22	2,380	7.93	5.6	0.7
13	Muddy Creek	21	3,040	5.54	10.2	1.4
14	Clear Creek	20	1,260	5.21	4.5	0.6
15	Center Branch	20	1,010	0.65	28.9	3.8
16	East Branch	15	2,080	1.03	37.5	5.0
	St. Joseph River Watershed					
17	Bear Creek	35	11,900	9.76	22.7	2.2
18	Clark Fork	30	5,460	7.20	14.1	1.3
19	Nettle Creek	30	15,200	9.58	29.5	2.9
20	West Branch	41	15,300	2.75	103.3	9.8
21	West Branch	42	14,330	2.53	105.2	10.0
22	Eagle Creek	23	2,750	2.37	21.6	2.1
23	Fish Creek	25	8,120	1.31	115.6	11.0
24*	Main Stem	32	44,610	1.22	678.0	64.6
25*	Main Stem	42	126,040	3.18	737.6	70.2
26	East Branch	30	7,200	3.65	36.7	3.5

(All impoundment sites are located in Ohio or Michigan. See Figure 10)

*Of the sites studies by the Corps, the only ones that would merit further consideration were Sites 6, 7, and 9 on the St. Marys River and Sites 24 and 25 on the St. Joseph River. The three sites on the St. Marys River would have a total capacity to store 5.4 inches of runoff and the average area controlled would be 56 percent of the St. Marys River basin. The two sites located on the St. Joseph River have a combined capacity of 4.4 inches of runoff would control an average of 67 percent of the total St. Joseph River basin area. The approximate location of the studied sites is shown on Figure 10.



Alternative 5

FIGURE 10

Potential Dam and Reservoir Sites

– Potential Dam and Reservoir Site

⊖ Sites That Merit Further Study

6. Alternative 6 Combination of Floodproofing and Permanent Evacuation

A combination of floodproofing existing facilities and permanent evacuation of those facilities not feasible to floodproof was also addressed in the Preliminary Feasibility Report for Flood Control (June, 1976), U.S. Army Corps of Engineers, Detroit District. Alternative 6 is an updating of the costs presented in the 1976 Corps report with some additional considerations.

First of all, some qualifications must be stated about floodproofing in general. Floodproofing can be most effectively and economically provided in the design of new construction. However, floodproofing can be applied successfully to existing structures under certain limited circumstances. Usually, floodproofing is suitable only where moderate flooding with low stage, low velocity and short duration flooding is experienced.

Floodproofing of existing homes and commercial buildings typically consists of structural modifications to the building so that floodwaters cannot penetrate and cause damage. These modifications could be provided in a variety of ways. A new foundation could be built and the house raised to a level above the design flood stage. An individual dike, earthen or metal, with a removable flood gate at the main entrance could be built around the house. For certain houses subject to only minor water levels, waterproof windows and doors could be installed. Some economy could be achieved if a group or block of houses were surrounded by the same dike.

The typical design considered in the 1976 Corps report was the placement of a series of aluminum panels immediately adjacent to the building (see Figure 12). This method would effectively surround the buildings and prevent damage

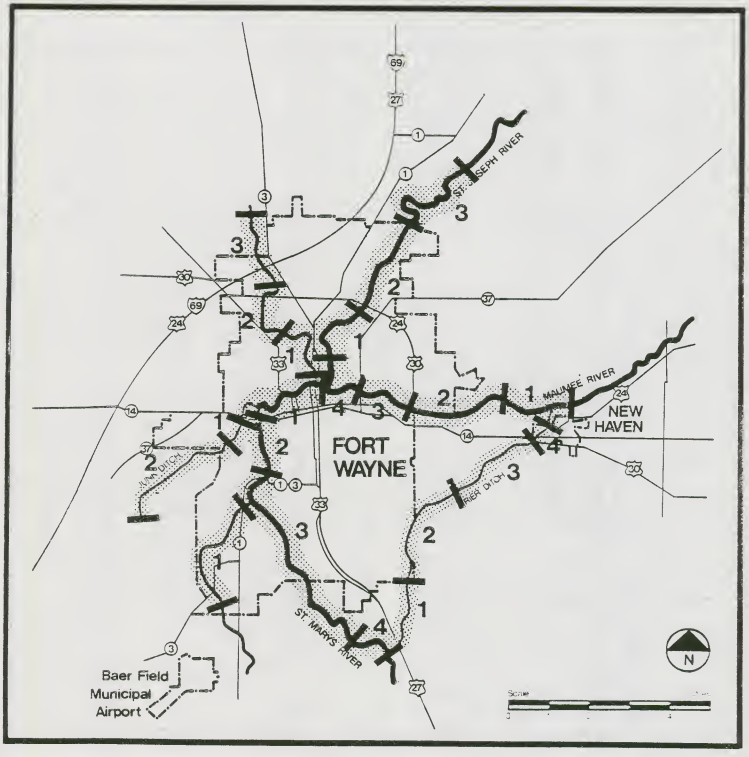
from floodwaters. The panels would only be in place during flood periods. Obviously, this method of floodproofing would require a timely and disciplined effort by the property owner to install the panels during periods of impending floods. There are a number of disadvantages with this method, including but not limited to personal inconveniences, possibility of panels not getting placed in time, possible leakage through panels, isolation of the building by floodwaters, and aesthetic considerations.

Floodproofing costs were studied in the 1976 Corps report by stream reaches. The reaches are depicted for the various rivers and ditches in Figure 11.

Table 16 is the estimate of costs of proposed residential floodproofing by study reach. The number of units considered for floodproofing were counted by study reach. The average perimeter of the residential buildings was established and a cost estimate for the chosen typical floodproof wall design was made (see Table 17). The 1976 Corps report's 15 percent contingency for this method was increased to 20 percent in order to allow for possible additional costs associated with this method such as backwater valves, sump pumps where basements are involved, supplementary sandbagging, waterproofing and other costs. Recent floods have taught us that simply holding the surface floodwaters back is not always enough.

The criteria established is to floodproof all buildings where the design flood stages would be less than two feet above the first floor elevation. All buildings where flooding would be higher than two feet above the first floor would be permanently evacuated. Table 18 is an estimate of the cost of proposed permanent evacuation of residential buildings by stream reach as updated from the 1976 Corps report.

In addition to the combination of floodproofing and permanent evacuation of residential buildings, consideration should be made for commercial and industrial buildings. Assuming that the smaller commercial buildings located within the residential neighborhoods of study were counted and included in the 1976 Corps reports (see Tables 16 and 18), only larger buildings are being considered further in this alternative. Examination of zoning maps, contour maps and recent flood high water marks indicate that the majority of the larger commercial/industrial buildings subject to flooding could be considered for floodproofing. No permanent evacuation of the larger buildings has been considered in this alternative. Table 19 shows the total number of larger commercial/industrial buildings and the associated costs for floodproofing using the same method as the 1976 Corps report.



Study Reaches

FIGURE 11

Reach Boundaries

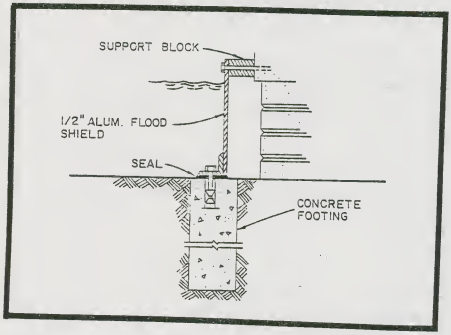
TABLE 16
Estimate of Cost of Proposed Residential Floodproofing

Stream	Reach Number	No. of Units	Perimeter (110'/Avg.)	Cost @ $120/LF*	Direct Cost**	E/D & S/A***	Total Cost
Maumee	1	60	6,600	792,000	950,000	142,000	1,092,000
	2	--	--	--	--	--	--
	3	--	--	--	--	--	--
	4	--	--	--	--	--	--
St. Marys	1	1,765	194,150	23,298,000	27,958,000	4,194,000	32,152,000
	2	439	48,290	2,195,000	2,634,000	395,000	3,029,000
	3	144	15,840	1,901,000	2,281,000	342,000	2,623,000
	4	2	220	26,000	31,000	5,000	36,000
St. Joseph	1	323	35,530	4,264,000	5,117,000	768,000	5,885,000
	2	2	220	26,000	31,000	5,000	36,000
	3	2	220	26,000	31,000	5,000	36,000
Junk Ditch	1	--	--	--	--	--	--
	2	253	27,830	3,340,000	4,008,000	601,000	4,609,000
Trier Ditch	1	--	--	--	--	--	--
	2	58	6,380	766,000	919,000	138,000	1,057,000
	3	--	550	66,000	79,000	12,000	91,000
Fairfield Ditch	1	24	2,640	317,000	380,000	57,000	437,000
Spy Run	1	105	11,550	1,386,000	1,663,000	249,000	1,912,000
	2	--	--	--	--	--	--
	3	--	--	--	--	--	--
TOTALS		3,182	350,020				$53,000,000

*See Table 16
**Includes 20 percent for contingencies
***Engineering and Design (8 percent), Supervision and Administration (7 percent)

TABLE 17
Cost Estimate for Typical Floodproof Wall Design (per lineal foot)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	1.3	Cubic Yard	$ 3.20	$ 4.16
Backfill	1.3	Cubic Yard	5.20	6.76
Concrete	0.2	Cubic Yard	88.00	17.60
Reinforcing Steel	5.0	Pound	0.56	2.80
Anchor Bolts	0.5	Each	6.40	3.20
Seal	1	Linear Feet	2.80	2.80
Aluminum 1/2"	23.1	Pound	3.20	73.92
Misc. Items	--	Lump Sum	--	8.76
Total Cost per L.F. of Wall 3.5' High				$120.00



Typical Floodproofing Design **FIGURE 12**

TABLE 18
Estimate of Cost of Proposed Permanent Residential Evacuation

Stream	Reach Number (See Figure 11)	Number of Units	Replacement Cost*	Demolition	Direct Cost**	E/D & S/A***	Total Cost
Maumee	1	13	$ 179,000	$ 27,000	$ 237,000	$ 35,000	$ 272,000
	2	279	2,469,000	537,000	3,498,000	525,000	4,023,000
	3	--	--	--	--	--	--
	4	1,336	40,107,000	2,744,000	49,279,000	7,391,000	56,670,000
St. Marys	1	223	3,171,000	458,000	4,173,000	626,000	4,799,000
	2	135	2,058,000	277,000	2,685,000	403,000	3,088,000
	3	49	3,267,000	101,000	3,873,000	581,000	4,454,000
	4	2	45,000	4,000	56,000	8,000	64,000
St. Joseph	1	--	--	--	--	--	--
	2	--	--	--	--	--	--
	3	2	156,000	4,000	184,000	27,000	211,000
Junk	1	--	--	--	--	--	--
Ditch	2	7	140,000	14,000	177,000	27,000	204,000
Trier	1	--	--	--	--	--	--
	2	2	64,000	4,000	78,000	12,000	90,000
	3	--	--	--	--	--	--
	4	1	28,000	2,000	34,000	5,000	39,000
Fairfield Ditch	1	575	13,453,000	1,181,000	16,829,000	2,524,000	19,353,000
Spy Run	1	5	145,000	10,000	178,000	27,000	205,000
	2	--	--	--	--	--	--
	3	10	160,000	20,000	207,000	31,000	238,000
TOTALS		2,639					94,000,000

NOTES: *Market values in Preliminary Feasibility Report for Flood Control (June, 1976) updated by increasing values 8% per year for 6 years.
**Includes 15 percent for contingencies
***Engineering & Design (8 percent), Supervision & Administration (7 percent)

TABLE 19
Estimate of Cost of Proposed Commercial/Industrial Floodproofing

Number of Units	Perimeter (550' avg.)	Cost @ $120/LF*	Direct Cost**	E/D & S/A***	Total Cost
114	62,700	$7,524,000	$9,029,000	$1,354,000	$10,383,000

NOTES:

*For typical design cost, see Table 17
**Includes 20 percent for contingencies
***Engineering & Design (8 percent), Supervision & Administration (7 percent)

In summary, Alternative 6 could permanently control flood damage as long as the appropriate flood plain regulations were enforced for the evacuated areas. Table 20 shows the complete cost for the combination of floodproofing and permanent evacuation alternative.

TABLE 20
Summary of Costs: Alternative 6

Estimate of cost of proposed residential floodproofing	$53,000,000
Estimate of cost of proposed permanent residential evacuation	94,000,000
Estimate of cost of proposed commercial/industrial floodproofing	10,000,000
TOTAL	$157,000,000

7. Alternative 7 — Provide Adequate River Cross Section

The concept of this alternative would be to widen the three rivers to handle the design flood flows. To increase the carrying capacity of the three rivers would require clearing, dredging and excavation. Due to the widening of the rivers, many of the bridges will be modified or replaced. There would also be a significant amount of residential, business, and structural displacement. However, this would not be as vast as that considered in Alternative 3.

The work on the cross sectional improvements to the St. Joseph River can all be done within the confines of the existing banks, and no bridges will require replacement. The St. Marys River will require a more extensive improvement, and the increase in span of several bridges. Those that have been considered in this proposal include:

1. Bluffton Road
2. Hale Street
3. Taylor Street
4. West Jefferson
5. Main Street
6. Sherman Street
7. Old Wells St. (removed, not replaced)
8. Harrison Street
9. Clinton Street
10. Spy Run Avenue
11. Wabash Railroad Bridges (2)
12. Penn Central Railroad Bridge

There is, for the most part, ample room to expand the Maumee River cross section and not effect developed areas. The most critical cross section is the section between Columbia Street and Anthony Boulevard, particularly the stretch between the Edgewater dike and the Norfolk & Western Railroad. The study proposes to use full-height concrete retaining walls within this area to affect the greatest cross section. The only bridge that is anticipated to be effected along the Maumee is the Coombs Street bridge.

The estimated costs associated with this alternative are listed in Table 21.

TABLE 21
Summary of Costs: Alternative 7

Description	St. Joseph	St. Marys	Maumee	Totals
Channel Dredging & Widening	$3,600,000	$10,435,000	$45,500,000	$ 59,535,000
Special Channel Walls, Levees, Etc.	500,000	None	4,300,000	4,800,000
Railroad Bridges	None	15,000,000	5,000,000	20,000,000
Roads & Highway Bridges	None	25,000,000	3,500,000	28,500,000
Demoliton and Clearing	150,000	2,500,000	250,000	2,900,000
Utility Relocation	None	3,500,000	10,000,000	13,500,000
Lands, Easements and R/W	None	1,500,000	2,500,000	4,000,000
Contingencies	400,000	6,500,000	7,500,000	14,400,000
Engineering & Design	372,000	3,720,000	4,120,000	8,212,000
Supervision & Administration	325,000	2,970,000	3,300,000	6,595,000
TOTAL	$5,347,000	$71,125,000	$85,970,000	$162,442,000

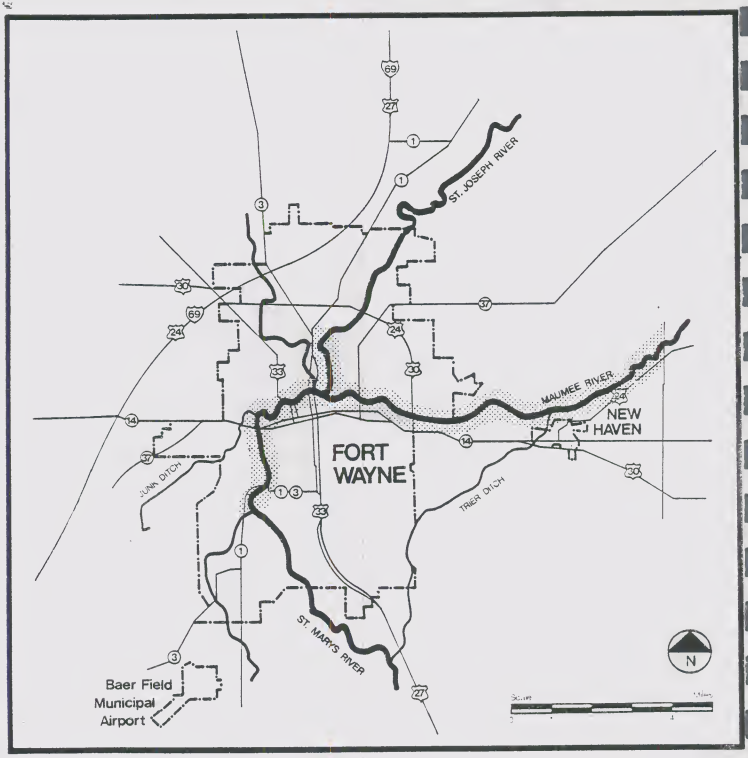


FIGURE 13

Alternative 7

Improve River Cross-Sections

Area to be Widened

8. Alternative 8 St. Joseph/Trier Ditch Cut-Offs

This alternative proposes the construction of two new major waterways, the St. Joseph and the Trier Ditch Cut-Offs. Each waterway diverts 10,000 cfs of peak discharge volume to separate confluence points along the Maumee River. Under such a concept, all of the existing facilities within the City, such as dikes, internal drainage, and bridges, would be adequate.

The St. Joseph Cut-Off requires the crossing of a natural shed line, thereby requiring excessive excavations. Because of this condition, the use of tunneling would be expected, and estimates have been prepared under such an assumption. The routing of the St. Joseph Cut-Off is similar to that of the Trier Ditch, in that it crosses mainly undeveloped properties, thereby limiting any permanent structural displacements.

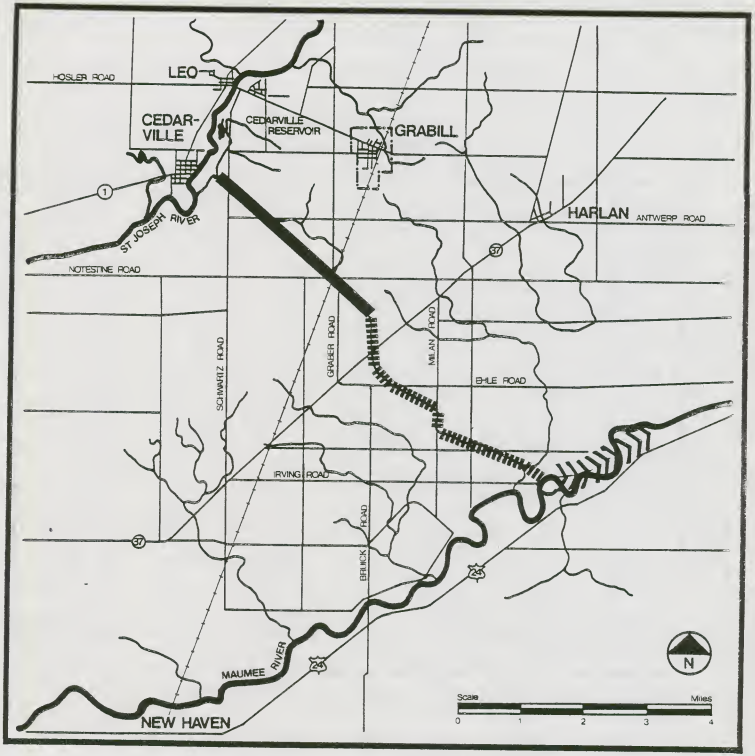
The Trier Ditch Cut-Off under this proposal would be identical to that of the 1959/76 Corps report which appears as part of Alternative 2 and 4.

Each alternative requires the acquisition of additional rights-of-way for construction and each will require modifications to the Maumee River at their points of confluence as well as downstream. The length of the St. Joseph Cut-Off is approximately 8 miles, and the Trier Ditch Cut-Off is approximately 9.5 miles. The routes of the two alternatives are depicted on Figures 7 and 14.

As described earlier, a portion of the St. Joseph Cut-Off project requires tunneling due to the excessive depth that negates the open cut or exposed type waterway. A single, as well as multiple, tunnel and conduit was investigated.

It was found that for the volume and gradient available, the single tunnel would be 32 feet in diameter. Based upon the size of the equipment necessary for such a tunnel, it was determined that a multiple tunnel project could be completed at less cost. There the proposed tunnel and conduit is based upon three 18-foot diameter tunnels with common inlet and outlet structures.

The costs associated with the Trier Ditch Cut-Off have already been developed as part of Alternative 4 and they amount to $57,800,000. The summary of costs for the St. Joseph Cut-Off is provided in Table 22.



St. Joseph River Cut-Off FIGURE 14

Tunneling

St. Joseph River Cut-Off

Channel Improvements

TABLE 22
Summary of Costs: Alternative 8

Description	St. Joseph Cut-Off	Trier Ditch Cut-Off 40 percent	Totals
New channels including clearing	$ 7,500,000	$ 9,010,000	$ 16,510,000
Maumee channel increase, including clearing	3,350,000	4,000,000	7,350,000
Tunnel and conduit	90,000,000	None	90,000,000
Diversion & Floodway Control Structures	8,000,000	8,370,000	16,370,000
Railroad Bridges	None	7,950,000	7,950,000
Lands, Easements & R/W	3,500,000	7,590,000	11,090,000
Relocations:			
Roads & Highway Bridges	9,223,000	13,830,000	23,053,000
Dwellings	250,000	1,050,000	1,300,000
Utilities & Contingencies	3,640,000	3,060,000	6,700,000
Engineering & Design	5,603,000	4,389,000	9,992,000
Supervision & Administration	4,480,000	3,840,000	8,320,000
TOTALS	$135,546,000	$63,090,000*	$198,636,000

*Includes Maumee River channel increase downstream from Trier Ditch Cut-Off

9. Alternative 9 — Protection by Constructing Dikes/Levees and Increasing Heights of Existing Dikes/Levees

This alternative proposes to protect flood areas by constructing dikes and/or increasing the heights of existing dikes to a sufficient elevation wherein the areas will not be flooded. The methodology used in developing the protection levels for this alternative is described below.

a. Maumee River

The proposed design flow for the Maumee River is 34,000 cfs. In reviewing existing and available backwater curves and profiles for the Maumee River, it was found that the proposed Flood Insurance Study (F.I.S.) high water profile for the 500-year flood carried a flow of 33,000 cfs, or very close to the proposed design flow. Therefore, the design level of protection for the dikes along the Maumee was established as the proposed 500-year F.I.S. plus two feet of freeboard.

b. St. Joseph River

The proposed design flow for the St. Joseph River is 15,800 cfs. In reviewing the proposed F.I.S. high water profiles and related flow, it was found that the 15,800 cfs design flow fell between the 100 and 500-year F.I.S. profiles. Therefore, the flood protection elevation that was utilized was the 250-year proposed F.I.S. plus two feet of freeboard.

A comparison was made of the proposed protection elevations against the actual flood elevations of 1982. It was observed in the area of the St. Joseph River north of Coliseum Boulevard that the actual 1982 flood was at a higher elevation than the 250-year proposed F.I.S. high water profiles. In these instan-

ces, the proposed dike elevation was established by adding two feet to the actual 1982 flood elevation experienced.

c. St. Marys River

The design flow for the St. Marys River for this study is 21,600 cfs. The proposed F.I.S. profile for the 500-year flood is 18,800 cfs. The protection level established for dikes along the St. Marys was taken as the 500-year proposed F.I.S. plus two feet. A comparison was made with the actual 1982 flood, as well as the 1913 flood, and the conclusion was reached that the protection elevation as proposed was adequate.

In preparing this alternative, a study was made of topographical maps along all stretches of the river. The flood elevations described above, the proposed protection elevations, and the high water marks for the 1982 flood were plotted. Based upon this, a determination was made where existing dikes would have to be increased in height and where new dikes would have to be constructed. Further, a judgment was made whether the dike construction could be earthen dike where adequate room was available for construction or a concrete and steel dike where available construction space was limited. Based upon this determination, quantity take-offs have been made showing the lineal feet of dike proposed for each of the rivers and whether this dike is earthen or concrete and steel. Table 23 shows the estimated cost for dike protection along the Maumee, St. Marys, and St. Joseph Rivers including Spy Run Creek.

d. Junk Ditch

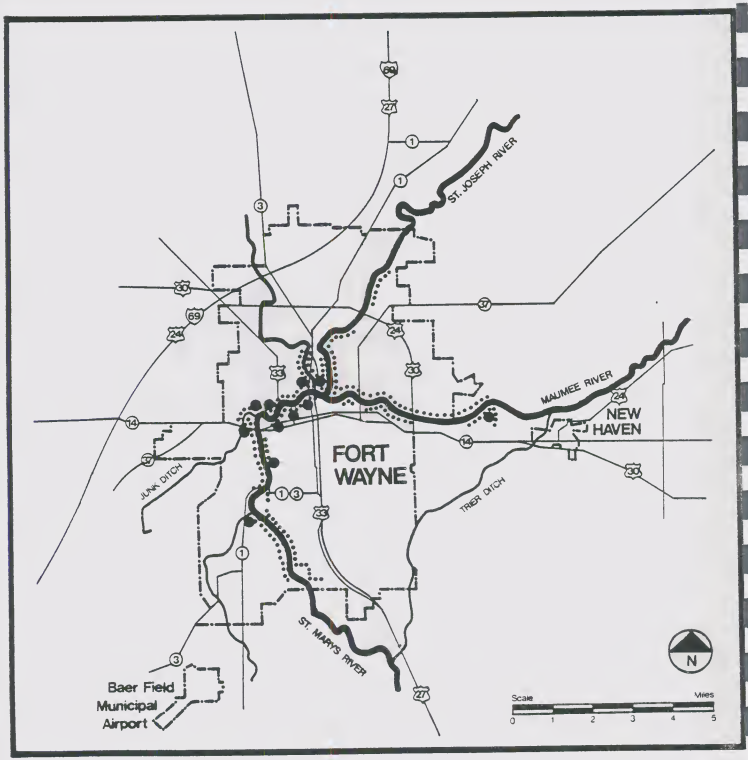
The proposed scheme for protection of the Junk Ditch area incorporates the report prepared by the Corps in 1968. The report is entitled Reconnaissance

Report on Flood Control of Junk Ditch. This report proposes constructing dikes along both sides of the Junk Ditch and installing pumping stations to take care of interior drainage. The estimated costs for Junk Ditch portion is updated in Table 24.

e. Fairfield Ditch

The concept for protection of the Fairfield Ditch includes the scheme as prepared by the Corps of Army Engineers in their 1967 report Detailed Project Report on Flood Control for Fairfield Ditch. This scheme proposes constructing a gate and dike along the St. Marys River, preventing the St. Marys River from backflowing into the Fairfield Ditch area. The Corp's plan proposed the construction of a large ponding area at the corner of Ardmore and Lower Huntington Road. This was determined not feasible by City officials at the time the project was considered. The concept included in this alternative proposes to eliminate that ponding area and increase the pumping station capacity adequately to handle the flows from the Fairfield Ditch. It is anticipated that the Fairfield Ditch peak flows will occur prior to the St. Marys River cresting, thereby allowing gravity flow conditions during most periods. Table 25 shows estimated costs for protection of the Fairfield Ditch area. This proposal does not include a Trier Ditch bypass or any permanent evacuation and acquisition.

Extensive internal pumping will be required under this alternative. Pumping stations will have to be constructed and/or modified to handle the internal drainage. It is anticipated that under this alternative the river staging will increase over prior experience due to the confinement of the flood flows within the channeled or diked river section. Easements and rights-of-way will have to be acquired throughout the project to accomodate this construction.



Alternative 9

FIGURE 15

Total Levee Protection with Internal Drainage Improvements

••• New/ Improved Levees and Walls

● New/ Improved Pumping Stations

TABLE 23

Estimated Cost for Dike Protection of Maumee, St. Marys and St. Joseph Rivers

	Maumee River	St. Marys River	St. Joseph River	Spy Run Creek	Totals
Levees (earthen)	$ 3,945,000	$ 4,410,000	$1,550,000	$3,060,000	$12,965,000
Floodwalls (conc/steel)	900,000	7,920,000	3,072,000	2,760,000	14,652,000
Pump Stations (including outfalls & interceptors)	4,000,000	35,323,000	---	---	39,652,000
Land, Easements & R/W	750,000	1,275,000	465,000	150,000	2,640,000
Contingencies	1,439,000	7,339,000	763,000	869,000	10,437,000
Engineering & Design	883,000	4,501,000	468,000	549,000	6,401,000
Supervision & Administration	772,000	3,939,000	410,000	481,000	5,602,000
TOTALS	$12,689,000	$64,707,000	$6,728,000	$7,896,000	$92,020,000

TABLE 24
Estimated Cost for Protection of Junk Ditch Area by Dikes

Levees	$935,000
Floodwalls	526,000
Protective Structures	995,000
House Removal	503,000
Pump Stations	3,098,000
Land, Easements, R/W Acquisition	680,000
Contingencies	1,347,000
Engineering & Design	647,000
Supervision & Administration	566,000
TOTAL	$9,297,000

TABLE 25
Estimated Cost for Protection of Fairfield Ditch Area

Barrier Dam & Levee	$ 738,000
Control Structure at Barrier Dam	660,000
Pumping Station, Inlet & Outlet Structures	7,700,000
*Land, Easements, R/W Acquisition	---
Contingencies	909,800
Engineering & Design	700,500
Supervision & Administration	500,000
TOTAL	$11,208,000

*Already purchased by City of Fort Wayne

TABLE 26
Summary of Costs: Alternative 9

Estimated Cost for Dike Protection along the Maumee, St. Marys and St. Joseph Rivers including Spy Run Creek	$ 92,020,000
Estimated Cost for Protection of Junk Ditch area	9,297,000
Estimated Cost for Protection of Fairfield Ditch area	11,208,000
TOTAL	$112,525,000

III. Summary

The identification and analysis of nine alternatives to the flooding problem provided an array of solutions. Each of the alternatives present a different approach to the problem.

A brief review of the nine alternatives reveals some interesting facts. Five contain a combination of flood protection measures. Of these, four rely to varying degrees upon the development of the Trier Ditch Cut-Off. Alternative 1 places the heaviest emphasis on the Trier Ditch Cut-Off when it proposes that the ditch be constructed to carry 80 percent of the designed floodwaters from the St. Marys River. The other three solutions, Alternatives 2, 4, and 8 propose that the Trier Ditch carry 40 percent of the floodwater. However, all three solutions propose varying improvements to deal with the remaining floodwaters not carried away by the ditch.

Several of the alternatives indicate the need for the permanent evacuation of residents and structures in flood prone areas. Most of these solutions suggest the evacuation of small areas of the community to supplement other flood protection measures. However, Alternatives 3 and 6 propose that permanent evacuation measures be initiated as a principal flood protection tool, thereby, requiring large portions of the flood prone community be relocated. Alternative 3 proposes the total evacuation and acquisition of all floodprone land. Alternative 6 combines floodproofing with permanent evacuation efforts. All structures subject to flooding of less than two feet would be floodproofed, and all structures subject more than two feet of floodwater would be evacuated.

A final point of interest regarding the nine flood alternatives is their development costs. All of the solutions are very expensive to develop, ranging in cost from $107,356,000 to $232,070,000. The least expensive solution is Alternative 1, followed closely by Alternatives 9 and 4. All three of these solutions are under $120,000,000. Three of the most expensive solutions are 3, 5, and 8. Alternatives 3 and 5 are estimated to cost over $200,000,000 while Alternative 8 at $198,636,000 is less expensive. The following table provides a cost comparison of the nine solutions.

TABLE 27
Summary of Costs: Alternatives 1 through 9

Alternatives	Total Cost
1. Trier Ditch Cut-Off (80 percent Diversion) with Appurtenances	$107,356,000
2. 1959/76 Corps of Engineers Plan	$152,628,000
3. Total Evacuation & Relocation	$229,020,000
4. Trier Ditch Cut-Off (40 percent Diversion) with Appurtenances	$119,301,000
5. Upstream Impoundments	$208,954,620
6. Evacuation Coupled with Floodproofing Where Applicable	$157,000,000
7. Improve All River Cross Sections as Required Design Frequency	$162,442,000
8. St. Marys/St. Joseph Cut-Offs	$198,636,000
9. Total Diking or Floodwall Protection with Internal Drainage Improvements	$112,525,000

Evaluation and Selection of the Optimal Solution

Section Five

I. Introduction

The control and prevention of flooding in the Fort Wayne-Allen County area will require a multi-faceted approach. The purpose of Section Five is to examine the process involved in arriving at an optimal set of solutions to the flooding problem, to explain why those solutions were considered to be the best available, and to examine issues relating to implementing those solutions.

II. The Process of Selecting the Optimal Solution

The process of selecting the optimal solution for protecting area residents, homes, and businesses from flooding involved three tasks: (1) careful analysis of the broad range of alternative solutions, (2) collecting and considering public comment on the merits of alternative solutions, and (3) deciding which solutions to implement. These tasks were performed by the Flood Protection Planning Team and the Mayor's Floodplain Management Advisory Group.

A. Flood Protection Planning Team

The Flood Protection Planning Team was a group of planners, engineers, and other community leaders who were charged with the task of generating, within 30 days of the 1982 flood, a comprehensive plan for preventing future flooding in the Fort Wayne-Allen County area. With the assistance of Bonar and Associates, a local consulting engineering firm, the Team developed and analyzed the comprehensive solutions discussed in Section Four. The Team also reviewed the short range solutions suggested by the Federal Emergency Management Agency (FEMA) in their Interagency Flood Hazard Mitigation Report of April 5, 1982.

B. Citizen Participation

The primary vehicle for citizen participation were two public meetings sponsored by the Mayor's Floodplain Management Advisory Group. The first public meeting was held on Thursday, April 15, 1982, at 7:00 p.m., in the Council Chambers of the City-County Building in downtown Fort Wayne. The purpose of this meeting was to present the alternative solutions to interested citizens and to gather comments on the merits and demerits of the individual alternatives. The following paragraphs summarize the most important concerns expressed by citizens at this meeting. The second public hearing was held on May 15, 1982 after the Flood Protection Planning Team had selected Alternative 4 as the best solution. This hearing is discussed in more detail in Section V, "Public Response to Alternative 4".

The general consensus of the 22 people who made comments at the public meeting was that they were tired of the flooding problem and would support a long term, capital intensive project that significantly reduces flood damage. Several persons cautioned, however, that it would be a long time, if ever, before any of the nine alternatives would be completed. In the meantime, Fort Wayne should not remain defenseless, but should be promoting actions to reduce flood damage in the immediate future.

At least four persons raised questions about plans to raise the dikes. It was pointed out that dikes broke in several places in the Bella Vista area and that the use of four-wheel drive vehicles and motorcycles on the dikes was probably a major reason for this. Several people commented that for the dikes to operate effectively, they would have to be protected from off-road vehicles and that this would be a formidable task. One person commented that a diking solution would shut off the City from the river, and that this would be aes-

thetically disruptive. Another person expressed concern about what would happen if one of the dikes broke, while another person stated dikes would be useless unless the flooding caused by sewer back-ups could be eliminated. One person did state, however, that dikes should be raised in the Nebraska Neighborhood.

Floodproofing was regarded by several people as only a limited, stop-gap action which could be used in the short run, and then, only with limited results. In fact, several people thought that by preventing water from getting into the basement and equalizing the pressure on the walls from the saturated ground, the basement walls could collapse. This might result in damages being greater than they would have been without floodproofing.

One woman stated that she favored Alternative 1 since it diverted 80 percent of the floodwaters around Fort Wayne. Another speaker also favored a diversion scheme, suggesting that a road could also be constructed above the diversion ditch. Finally, a City Councilperson stated that priority should be given to the alternative which causes the least disruption to people and property.

Regarding short-term actions, several people mentioned the need to improve flood-fighting efforts. It was suggested that a computer be used to determine which areas will flood first, and that government officials develop a flood-fighting plan. Included in this plan would be an early warning system, and standard operating procedures for sandbagging, impromptu dike building, and evacuation.

III. Evaluation of Alternative Solutions

Based on the technical analysis and public reaction to the alternative comprehensive solutions to the flooding problem, the Flood Protection Planning Team was able to comparatively evaluate the alternatives. The Team evaluated the alternatives based on the criteria listed below:

1. Technical feasibility
2. Monetary cost
3. Effectiveness and reliability in reducing flood damage
4. Energy and resource use
5. Public acceptance
6. Implementation capability
7. Impact on the natural environment
8. Social and economic impact

Table 28 summarizes the major advantages and disadvantages associated with each alternative solution. The following table is a highlight of the results of the Team's evaluation, and not a detailed assessment of the effects of each alternative.

TABLE 28
Highlights of the Nine Alternatives

ALTERNATIVES	ADVANTAGES	DISADVANTAGES
Alternative One: Trier Ditch Cut-Off (80 percent diversion) Dredge St. Joseph River **Cost: $108 million**	-The least expensive -Reliable -Effective in reducing flooding (upon completion only) -Minor economic and social impact	-provides no protection until project is completed
Alternative Two: 1959/1976 Corps of Engineers Plan includes Trier Ditch Cut-Off (40% diversion), channel modifications, levees, and floodwalls **Cost: $153 million**	-Provides some flood protection measures in the short run	-Moderately high cost
Alternative Three: Total permanent evacuation of flooded areas **Cost: $229 million**	-Returns riverbanks and floodplain to more natural state -Reliable and effective in reducing damage from flooding -Potential recreational use of evacuated floodplain areas	-Significant social and economic disruption resulting from relocation of businesses and homes -Anticipated negative public reation -Most expensive of the alternatives

ALTERNATIVES	ADVANTAGES	DISADVANTAGES
Alternative Four: Trier Ditch Cut-Off (40% diversion), Dredge St. Joseph River, improve dikes and levees, limited evacuation in specific area **Cost: $119 million**	-Relatively low monetary cost -Can be implemented in phases, increasing effectiveness with each phase completed -Compatible with existing River Greenway Plan.	-Social and economic description due to evacuations
Alternative Five: Upstream impoundments, i.e., dams and reservoirs **Cost: $209 million**	-Very effective and reliable in reducing flooding in Fort Wayne-Allen County area -Potential recreational opportunities at reservoir sites	-Significant environmental impacts associated with dams and reservoirs -Questionable ability for local governments to implement -Very expensive
Alternative Six: Floodproofing and permenant evacuation in selected areas **Cost: $157 million**	-Returns some portions of riverbank and floodplain to more natural state -Potential recreational use of evacuated floodplain areas	-Effectiveness of floodproofing dependent upon timely and proper actions by building occupants -Social and economic disruption from relocation of business and homes -Moderately expensive to acquire/relocate/demolish current development

ALTERNATIVES	ADVANTAGES	DISADVANTAGES
Alternative Seven: Provide adequate river cross section, i.e., dredge and widen. **Cost: $172 million**	-Very reliable in reducing flooding	-Detrimental to natural environment of river and riverbanks -Expensive -Requires some evacuation
Alternative Eight: St. Joseph Cut-Off/St. Marys River Cut-Off **Cost: $199 million**	-Very effective and reliable in reducing flood flows through -Minor economic and social impact	-High cost (primarily due to cost of St. Joseph River Cut-Off tunnel) -Moderate impact on natural environment
Alternative Nine: Total diking/floodwall protection with internal drainage improvements **Cost: $113 million**	-Relatively inexpensive	-Less reliable than other solutions due to extensive maintenance needs -Significant commitment of energy and resources for internal pumping -Reduces aesthetic value of rivers

IV. Selecting the Optimal Solution

After weighing the technical considerations and public comments related to the alternative solutions, the Flood Protection Planning Team came to three conclusions.

- The Federal Emergency Management Agency's Interagency Flood Hazard Mitigation Report of April 5, 1982 contains short term recommendations for reducing flood hazards in Allen County. FEMA's report effectively directs the Corps of Engineers in their emergency structural repair work done pursuant to Public Law 99. Consequently, comprehensive solutions to the flooding problem should be examined with the understanding that these short range recommendations have been made by FEMA, will be funded in part by the Corps of Engineers, and represent positive steps to reduce damages from flooding in a short range time frame.
- Viable comprehensive solutions must contain plans to divert some portion of the St. Marys River 100 year floodwater around the built up areas of the Fort Wayne metropolitan area via the Trier Ditch Cut-Off. This concept of flood protection in Fort Wayne-Allen County was considered reasonable after the 1913 flood, and continues to be one of the most effective and workable solutions.
- The Trier Ditch Cut-Off suggested in Alternative 1 provides comprehensive flood protection once the construction of the diversion channel and related improvements is completed. However, until such time, no flood protection is offered to Fort Wayne-Allen County residents. With estimates of completion time for the Trier Ditch Cut-Off ranging from 5 to 15 years, it is clear that damage from floods may be considerable before the diversion channel becomes operable. Consequently, the optimal compre-

hensive solution will be one that will afford some degree of flood protection prior to completion of the Trier Ditch Cut-Off.

Based on the preceding conclusions, the optimal solution appears to be the multi-faceted approach embodied in Alternative 4. This solution involves the Trier Ditch Cut-Off, dredging of the St. Joseph River, improvements to dikes and levees, improvements to internal drainage, and evacuation of limited floodplain areas.

The implementation of Alternative 4 provides an opportunity to integrate the improvements recommended in FEMA's Interagency Flood Hazard Mitigation Report. Many of the recommendations made by FEMA involve short term efforts to prevent or reduce damage from flooding. In the same way, the non-diversion elements of Alternative 4 will provide some degree of protection until the Trier Ditch Cut-Off is completed. The floodfighting preparedness, internal drainage improvements and other actions recommended by FEMA also seek interim protection. Section Six explorea in more detail the phased implementation of Alternative 4.

V. Public Response to Alternative 4

After the Flood Protection Planning Team had selected Alternative 4 as the best solution, a second public meeting was held on May 15, 1982. The purpose of this meeting was to determine the community's reaction to this Alternative 4.

After the Alternative was fully explained to the audience of over 100 persons, 22 people made public comments. The comments were similar to those received

during the first public meeting. Most people wanted the flood problem alleviated and were willing to try any alternative. Several people were concerned, however, that Alternative 4 might not provide them with immediate protection. After it was explained that Alternative 4 would provide progressively increased levels of protection, beginning this year, most people stated that it was acceptable.

However, not everyone agreed with the Plan. A spokesperson for the Izaak Walton League stated that total evacuation of the floodplain would be the best solution. A spokesperson for the Coalition for the Environment said that a combination of measures (repairing and maintaining floodgates, dike repairs, limited dredging, limited evacuation, and limited floodproofing) would be successful. In addition, both people cited the need for a stricter floodplain ordinance and expressed concern about the downstream impacts of Alternative 4.

VI. Summary

Selecting a solution from the nine alternatives was a difficult task. However, based upon the comments received during the first public meeting and the technical analysis of the Flood Protection Planning Team, Alternative 4 was selected as the best solution.

Because little time has elapsed since Alternative 4 was unveiled as the selected solution, it is difficult to determine if a community concensus can be obtained. However, with a few exceptions, the public response (as embodied by the comments received during the second public meeting, the endorsement of at least one neighborhood association, and the editorial support of the Fort Wayne Journal Gazette) has been supportive of the Plan.

One of the most appealing characteristics of Alternative 4 is its ability to provide progressively increased levels of protection, beginning this year. Section Six will examine Alternative 4 in greater detail and special emphasis will be given to the phased implementation of this Plan.

Implementation

Section Six

I. Introduction

The previous section explained the process by which the optimal solution was selected, and why Alternative 4 was viewed as the optimal solution. Section Six will examine in more detail the implications of phased implementation of the programs and projects embodied in Alternative 4. After this introduction, the elements of Alternative 4 are divided into 12 individual tasks, each critical for the success of the flood control plan. A timetable for the accomplishment of these tasks is suggested. Finally, this section examines the legal aspects of extablishing a conservancy district to manage implementation, and existing sources of project funding.

II. Phased Project Implementation

One of the most appealing characteristics of Alternative 4 is its multi-faceted approach to controlling floods in the Fort Wayne-Allen County area. Its short term components, providing some degree of protection almost immediately, and its long term components, providing a greater degree of protection upon completion, form a comprehensive solution. It must be emphasized that each of 12 tasks listed below is crucial to the proper functioning of each of the others, and to the success of the entire flood protection effort. These tasks are seperated to facilitate the understanding of the timing of phased implementation, and are not meant to be viewed as seperate options for flood control. The 12 tasks that constitute implementation of Alternative 4 are as follows:

A. Flood Fighting Capability

B. Plan Approval and Adoption

C. New Entity

D. Interim Organization

E. Preliminary Design

F. Levees

G. Backwater Gates

H. Sewers and Pumping Stations

I. River Dredging

J. Ditch Cleaning

K. Land Acquisition

L. Trier Ditch Cut-Off

The implementation schedule in Table 30 suggests when each task could be started and completed. The schedule is an aggressive, optimistic, and realistic approach in completing the Plan. The times allowed for each task are adequate if all parties involved, i.e., local, state, and Federal governments, are willing to make the commitment to give the Fort Wayne-Allen County area a permanent flood control solution.

A. Flood Fighting Capability

It may be several years before all facets of the Flood Protection Plan are computed. In the interim, it is expected that the Fort Wayne-Allen County community will experience additional floods of varying serverity. To prepare for these floods, the floodfighting capacity of the community can be improved. A program to improve such capability might include the following:

1. Increased training for public and private floodfighters to adequately handle flood conditions. This training would include sandbagging techniques.

2. Development and implementation of a standard operating procedure for floodfighting in each neighborhood.

3. Development of an evacuation plan to include flood warning systems for each neighborhood threatened by past floods.

4. Preparation of maps identifying weak points in dikes and lines of defense for floodfighting.

5. Floodproofing of selected public facilities and private buildings. In a few cases where emergency sandbagging would be ineffective, private and public buildings could be protected by floodproofing. This is not to suggest an extensive commitment of resources to floodproofing, but rather the protection of a few structures that cannot be protected by other flood control measures.

6. Development of an intensive education program to inform property owners of the need for flood insurance and how to obtain insurance through the National Flood Insurance Program. Special emphasis would be placed on the importance of coverage for personal property.

7. Strengthening the City's floodplain zoning ordinance. Specifically, the non-conforming use section could be made more stringent. Also, a provision could be added that would require new development to have at least two feet of freeboard over the 100 year flood level.

These elements of a floodfighting program reflect many of the recommendations of the Federal Emergency Management Agency's Interagency Flood Hazard Mitigation Report. All of these flood fighting activities can be accomplished and in place by December 1, 1982. They are inexpensive, short-term actions which can substantially reduce the damage from future flood disasters that may occur prior to completion of the Flood Protection Plan.

B. Plan Approval and Adoption

The successful implementation of a flood control plan depends upon the support and approval of the community. Consequently, it is imperative to receive formal endorsement from the governmental units involved. It is recommended that the Flood Protection Plan be submitted for adoption by the City Plan Commissions of Fort Wayne and New Haven. The Plan Commission approvals should be adopted by both City Councils in ordinance form. Similarly, the Plan should be approved by the Allen County Plan Commission and adopted in the form of an ordinance by the Allen County Commissioners. In addition, the Plan should be reviewed and adopted by the City and County Park Departments for formal inclusion into their Rivergreenway development plans. The Rivergreenway Consortium should review and approve the plan. The various neighborhood associations, the Chamber of Commerce and other interested groups should also review and give the plan their support and approval. Regulatory agencies, including the Indiana Department of Natural Resources, the U.S. Army Corps of

Engineers, the Federal Emergency Management Agency, and the Federal Insurance Administration, should also review and approve the Plan. The approval and adoption process can be completed in six months, or by September, 1982.

C. New Entity

The improvements proposed in the Flood Protection Plan are geographically located in three jurisdictions: Fort Wayne, New Haven, and Allen County. The agency charged with the implementation of the Plan should be one which represents these interests and has the power to accomplish its charge. Consequently, it is necessary to create a new entity which has the legal authority to plan, design, construct, operate, and maintain flood control facilities, as well as the power to generate revenue through taxing and bonding. The new entity should be established and in operation by late 1983 according to the implementation schedule.

One model of an entity with such authority and power is the conservancy district. The specific powers, responsibilities, and method of establishing a conservancy district is explained in greater detail later in this section. The new entity charged with implementing the Plan, whether it is a conservancy district or some other form, will require these types of powers and authority to effectively control flooding.

D. Interim Organization

Until the new entity is in operation, an interim organization should be established to provide early guidance in Plan implementation. The interim organization should be composed of representatives from Fort Wayne, New Haven, Allen County, and other community interests, with ex-officio representation

from the U.S. Army Corps of Engineers and the Indiana Department of Natural Resources. The implementation schedule suggests that the interim organization should be established immediately and will be dissolved when the new entity is chartered.

E. Preliminary Design

The nine alternatives described in Section Four are based upon conceptual designs and first cost estimates. The next step involves preliminary design. The purpose of the preliminary design is to further study the solution and refine the proposed sope of work. This would include a detailed analysis of the proposed levee improvements necessary to accomplish the design objectives, including location, size, height, and cost of all levee work desired. It would also include a detailed analysis of backwater gates, pumping station improvements, and internal storm sewer systems. Further, the preliminary design would include studies on river dredging to determine proposed cross sectional areas necessary to meet design objectives. The preliminary design should be begun as soon as possible and completed by 1983.

F. Levees

Alternative 4 includes improvement to the levees along the Maumee, St. Marys, and St. Joseph Rivers. These improvements include raising the elevation, reconstructing, or constructing new levees. The design criteria establishes that the neight of the levees shall be equal to the calculated flood stage elevation based upon 40% of the St. Marys River flood flow being diverted through the Trier Ditch Cut-Off, plus two feet for freeboard. This levee design elevation means that the existing levees should be improved to afford increased protection over existing conditions, but will not provide full flood protection until the Trier Ditch Cut-Off is completed.

Generally, the levee heights in the Lakeside area are adequate, and only repairs and reinforcement of the existing dikes are necessary. The levees along the St. Joseph River, Spy Run Creek, and St. Marys River would require only moderate increases to meet the design levels. The levee work should begin in the summer of 1982 and be completed by 1985.

G. Backwater Gates

Under normal conditions, storm water drains off the City's streets into storm sewer pipes, and eventually into the area's three rivers. During times of high river stages, river water may back up the storm sewer pipes and flow into the street. This can be prevented if backwater gates, or tidegates or floodgates as they are sometimes referred to, are installed on storm sewer pipes where they empty into the rivers.

Recent surveys of all existing storm sewer outlets indicate that 93 outlets do not have backwater gates. Part of the suggested improvements to internal drainage systems suggested in Alternative 4 involves the installation of appropriate backwater gates on all active storm sewer outlets. This phase of the work can begin in the summer of 1982 and can be completed by 1983.

H. Sewers and Pumping Stations

Another type of improvement to interior drainage suggested in Alternative 4 is the rehabilitation of all major combined sewer overflow relief stations within the City and the construction of a new relief station along Junk Ditch. Combined sewer overflow relief stations are pump stations designed to pump combined storm and sanitary sewage into the river when heavy rains overload the sewage treatment facilities.

All of the existing relief stations in Fort Wayne can be readily improved with the exception of the Griswold Avenue facility. This station was determined to be undersized and a larger facility is proposed. Table 29 lists the existing combined sewer relief stations and their current capacities.

TABLE 29
Combined Sewer Overflow Relief Stations

Station	Number of Pumps	Capacity (Each in Gallons Per Minute)
Morton Street	3	14,000
Tecumseh Street	2	7,500
Nebraska (Camp Allen Dr.)	2	25,000
Griswold Avenue	2	7,500
Brown Street	2	20,000
Third Street	4	35,000

Along with the improvements to the stations listed in Table 29, additional work to the internal drainage systems that deliver flows to the respective stations is necessary. These improvements would insure that the areas drain effectively during flood periods which are coincidental with heavy rainfall.

The Morton Street, Tecumseh Street, Nebraska Street, and Brown Street stations require the improvement of the high head pumping capabilities of the pumps. This requires the replacement of one of the pumps in each station with a pumping system powerfull enough to overcome the pressure of the floodwater at the outlets.

The Griswold Avenue and Third Street stations will require the same type of improvements, but they will also require the additional pumps to increase their capacity. Two 35,000 gallons per minute (gpm) pumps are proposed at the Third Street station. The existing facility at Griswold Avenue is not capable of housing the required pumps, and an addition to the building is required. The existing 7,500 gpm pumps would be removed and kept as back-ups for the remaining 7,500 gpm pump at Tecumseh. Four new 15,000 gpm pumps would be installed in the expanded Griswold Avenue facility along with new outlets.

A new pump station is also necessary along Junk Ditch. This station would have the capability of draining the Junk Ditch area during high levels of the St. Marys River. The station would be located just south of the Penn Central railroad tracks along West Jefferson Boulevard. A backwater control structure would be provided at the passage of the Junk Ditch under the tracks. This control structure would allow the normal drainage to flow through. During flood stages on the St. Marys, the control structure would close the waterway and call for the pump station to deliver the Ditch's flow across this barrier. This new station would require a capacity of approximately 750,000 gpm.

In view of the high cost of this task, it should begin in the summer of 1982 and be phased over several years for completion in 1986.

I. River Dredging

To accommodate the design flood flows on the St. Joseph and Maumee Rivers, Alternative 4 includes dredging and channel improvements to remove siltation in three areas. These are at the confluence of the St. Joseph and St. Marys Rivers, downstream from the confluence to the Hosey Dam, and downstream from

the Trier Ditch Cut-Off and Maumee River confluence. The implementation schedule indicates commencing dredging in 1983 with completion by 1986.

J. Ditch Cleaning

It is proposed that Fairfield Ditch, Junk Ditch, and Spy Run Creek be cleaned to improve flow capacities. Aid is available through the Federal Emergency Management Agency (FEMA) to accomplish this.

The Junk Ditch would be cleaned from the St. Marys River to the Norfolk & Western Railroad. The Fairfield Ditch would be cleaned from the St. Marys River to the Norfolk & Western Railroad. Spy Run Creek would be cleaned from the St. Marys River to Grove Street. This ditch cleaning should be accomplished in 1982.

K. Land Acquisition

Alternative 4 proposes the possible acquisition of land and property located in the "thumb", the Michael St./Ross St., the Fairmount Place, and the Riverhaven areas. In addition, limited spot acquisition to accomodate levee improvements is necessary in the Nebraska and Oswego Avenue areas. Finally, emphasis will be placed on acquiring several properties that will enhance flood protection and which will also complement the Rivergreenway Project. Acquisition should begin in mid-1982 and will be completed by 1986.

The major acquisitions suggested under this alternative are only tentative and the final decision about the acquisition of a particular area will be dependent upon the severity of the flooding problem, the cost of the proposed acquisition, the wishes of the residents, and the overall community benefit. Fur-

thermore, with the exception of the Fairmount Place area, acquisition is not a priority of Alternative 4 since other flood protection measures are more cost-effective. Also, the possible acquisition of these areas will limit, but not necessarily preclude, all future development.

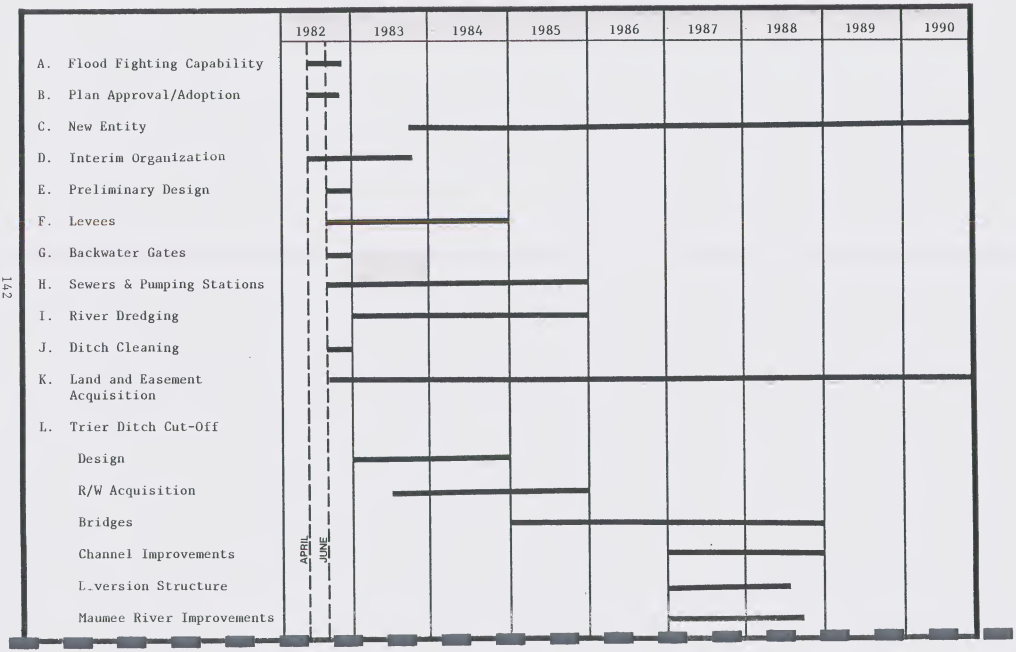
L. Trier Ditch Cut-Off

The Trier Ditch Cut-Off is a diversion channel designed to carry approximately 40 percent of the St. Marys River flood flow around Fort Wayne. Because the Trier Ditch Cut-Off is such a major project in the Plan in terms of cost and time requirement, the task of constructing the channel is further broken into sub-tasks on the implementation schedule (see Table 30). These subtasks include design, rights-of-way acquisition, bridge construction, St. Joseph River channel improvements, the diversion structure, and the Maumee River improvements.

The design subtask should begin in 1983 with completion in 1985. Rights-of-way acquisition should commence in mid-1983 and be completed by 1986.

The highway and railroad bridge construction should begin in 1985 with a completion date to coincide with that of the balance of the Trier Ditch construction. The St. Joseph channel improvements, diversion structure, and Maumee River improvements should commence in 1987. These dates could be staggered if found advantageous. However, it is probably that the funding will come from a single source and thereby allow all phases of work to begin concurrently. The Trier Ditch Cut-Off should be completed by 1990.

TABLE 30
Implementation Schedule



III. Funding Sources

To implement the Flood Protection Plan, a variety of funding sources will be required. At this stage of the development of flood control measures, it is not possible or practical to project which funding sources will be the most valuable and the degree of funding provided by each. The objective here is to identify potential sources of funding. In this regard, Table 31 provides an indication of where funding for the construction-related tasks might be secured. The remainder of Section Six is devoted to a detailed examination of two funding options deemed most feasible.

TABLE 31
Potential Funding Sources

SOURCES	TASK							
	Prelimin. Design	Levees	Backwater Gates	Pump Sta. Sewers	River Dredging	Ditch Cleaning	Acquisition	Trier Ditch
1. FEMA			X	X	X	X		
2. Corps of Engineers		X		X	X			X
3. HUD	X	X					X	
4. EPA	X		X	X				
5. FHWA (Federal Aid System)								X
6. IDNR (State funds)	X	X	X	X	X	X	X	X
7. IDOT (State Highway Bridges)								X
8. County of Allen	X	X	X	X	X	X	X	X
9. Park Dept. (County)	X	X			X	X	X	X
10. City of Fort Wayne	X	X	X	X	X	X	X	X
11. Park Dept. (City)	X	X			X	X	X	X
12. City of New Haven	X						X	X
13. New Entity (Taxing/ Bonding)	X	X	X	X	X	X	X	X
14. Donations -Private -Foundations		X X					X X	X X

In a flood control project of this size, funding options are, at best, limited. The first funding approach to be discussed in detail, is the establishment of a conservancy district. This district has the power to tax, bond, receive grants and gifts, etc. The second approach is a combination of three programs which are sponsored through the United States Army Corps of Engineers. These programs, which could be used as short range solutions, are also described in the following section. Any comprehensive solution to the flooding problem in Fort Wayne-Allen County will require extensive financial assistance from the Corps of Engineers (through Congressional appropriations) and permanent maintenance through the conservancy district.

A. Conservancy Districts

Conservancy Districts are autonomous units of government established to address serious drainage, irrigation, water, sewage, natural resource or flood control problems. The districts, which must be non-partisan and multi-jurisdictional to be effective, has through its board of directors, the powers to bond, tax, condemn real property, enter into agreements with Federal and state agencies and a variety of other powers. Conservancy districts can be the whole or parts of any City or County in Indiana, although boundaries of the district must be contiguous. The conservancy district, because of its structure and power, must be the agency which handles all flood related programs and projects on a long term basis. This includes all coordination between federal, state, and local agencies. This section will attempt to summarize the Conservancy District Act found in Indiana Code 19-3-2-1.

1. Procedure

Petitions requesting the development of a conservancy district can be approached in two ways. First, a petition signed by at least 5 percent (but not less than 2,500 signatures) of the landholders in the proposed district must be filed in the Clerk's office of the Circuit Court. Second, if a city is located within a proposed district, the legislative body of that city can establish a petition by ordinance. If the latter is used, landholders within the City who are opposed to the establishment of a conservancy district can request from the Circuit Court that their names be removed from the petition.

The petition must include the name of the proposed district, a discription of the territory to be included, a statement of the specific purpose and necessity of the district and a statement of the conduciveness of the district to improving the public welfare. If the petition is conditioned upon state and/or federal grants, a statement must be included addressing the conditions of the federal and/or state aid. If maintenance and operation of any improvement is to be solely paid for by funds generated by the district, a statement must be included explaining the tax benefit ratio.

Finally, the petition must state the number of directors to the Board (no less than 3, no more than 9) and must contain a statement as to the division of the district. The number of areas and the number of directors must be equal.

All legal costs, including legal notices, must be borne by the petitioners. In addition, the petitioners must post a bond sufficient to pay all legal costs and costs to the court connected with the proceedings in case the court refuses to establish the district and dismisses the petition.

2. Judicial Procedure

The Circuit Court of the county containing the most land within the proposed district has exclusive jurisdiction over the establishment of the district. The petition can be moved to another court in only two circumstances:

1. The petition was first filed in the wrong court; and
2. The petition is so amended that another county contains more land in the proposed district.

In any instance, the chosen court will have exclusive jurisdiction over all further hearings in connection with the district.

After receipt of the petition, the Circuit Court establishes a date for the hearing as a civil case. Notice of the hearing must be given at least 30 days in advance.

Anytime five days prior to the petition hearing, petitions against the district can be filed if the proper number of signatures are present. At the hearing, the court shall determine whether the petition bears the necessary number of signatures and if the petition complies with the requirements as to form and content. Corrections and amendments can be made to the petition if necessary.

If the court finds the petition in order, it shall enter an order referring the petition to the Natural Resources Commission which shall make a determination to the court as to the necessity of the district based on five criteria:

1. Appears to be necessary.
2. Holds promise of economic and engineering feasibility.

3. Seems to offer benefits in excess of costs and damages.

4. Proposes to cover and serve a proper area; and

5. Could be established and operated in a manner compatible with existing conservancy districts, flood control projects, reservoirs, lakes, drains, levees, and other water management or water supply projects.

State agencies must furnish for the Commission any assistance necessary for the completion of the report. Upon receipt of the Commission's report, the Court shall set a date for the hearing at least 21 days in the future. If the court orders the district established, it shall also order the number of directors of the district and the divisions of the district. Either an order dismissing or approving the petition can be appealed to the Indiana Supreme Court within 30 days.

3. Board of Directors

After the district is established, the court shall appoint the initial board of directors. Each director must be a landholder of the area or an officer or representative of a corporate landholder of the district. At each annual meeting, the directors shall be elected by a majority of the landholders in the district. The terms of the board of directors shall be staggered.

General powers of the board of directors include prescribing uniform rules pertaining to investigations and hearings, hiring personnel as needed, and the development of an annual report to the court listing income and expenses. In addition, the board of directors can make any legal, equitable or special remedy for the enforcement of the act pertaining to the establishment and operation of the conservancy district.

4. District Plan

After organization of the board, writing on a comprehensive district plan must begin. This plan must contain an engineering report which sets forth the general, and comprehensive plan for the accomplishment of the purpose or purposes for which the district was established. It must describe the physical nature of the district, the problems confronting the district, the works of improvement, and the benefits to be derived from such improvements. The plan must include maps, preliminary drawings, and estimates of costs based upon preliminary engineering surveys and studies. It must also include copies of any agreements or other arrangements with other persons or with any governmental agencies with respect to the financing, construction, maintenance, and operation of the improvement proposed in the district plan.

When necessary, to implement the plan the directors also have the following power:

1. To levy taxes on the real property within the district.
2. To make assessments on the real property within the district for exceptional benefits to such real property and further assessment pro rata for maintenance and operation of the works of improvement.
3. To issue bonds and short and long term notes.
4. To incur other debts and liabilities.
5. To exercise the power of eminent domain, both inside and outside the boundaries of the district, in accordance with the provisions of this act or any other eminent domain acts. In the exercise of this power, due care shall be taken to minimize interference with other public interests involved.
6. To make payments for the fair value of all property taken under any eminent domain proceedings; and in cases which are appealed, to make such payments into court and to proceed promptly in placing the district plan in operation.
7. To institute any type of civil legal proceedings in any court having jurisdiction over the person or property in question.
8. To purchase or rent property.
9. To sell services or property, which are produced incident to the district plan, and make a fair and reasonable charge therefor.
10. To make contracts or otherwise enter into agreements with private individuals, public or private corporations, or federal or state agencies, for construction, maintenance, or operation of any part of the district.
11. To receive and disburse funds.

12. Lease land and other assets to cities, towns or counties, or park boards thereof, the term and annual rental thereof to be adequate to meet the districts repayment schedule for financing, if any, of the land and other assets leased. Cities, towns or counties, or park boards thereof are hereby authorized to enter into such leases without limitation of any other laws regarding the receipt of petitions, the duration of the term of the lease, or the distance of such land and other assets from the corporate boundaries. The governing bodies of such cities, towns, or counties and park boards thereof may enter into such leases for terms as long as 50 years at such locations as they determine would be of benefit to their respective sities, towns, counties, or park boards, and upon such terms, conditions and covenants as are fair and reasonable. The board of directors may pledge the rental income from such lease as revenue for services or property produced incident to the operation of the district.
13. To perform necessary construction and maintenance work outside the district and even outside the state of Indiana, provided that there is voluntary agreement on the park of the people or organization outside of the state, if such work will confer benefits to the real property within the district in excess of costs and damages to be paid by the district.

The board has the authority to enter into agreements with and accept funds from any state or Federal agency.

B. Programs of the U.S. Army Corps of Engineers

In the short term, three programs are available through the Army Corps of Engineers. A brief explanation of the Corps and its programs follows.

The United States Army Corps of Engineers assists state and local governments in recovery from natural disasters and establishing civil works programs. These programs primarily include research and development, planning, design, and construction.

1. Protection, Clearing, and Straightening Channels (Emergency Dredging Projects)

The purpose of this program is to restore channels for purposes of navigation or flood control. Each project selected must be technically feasible, complete within itself, and economically justified. The non-Federal participants must provide all lands, easements, and rights-of-way for construction of the project and must bear all maintenance costs. Annual Federal expenditures are limited to $300,000 per project.

Applicants for this program must be states, political subdivisions of states, or other local agencies established under state law. In a formal letter to the District Engineer, the applicant must furnish evidence of legal authorization, financial capability and willingness to provide all necessary local participation and required cooperation. The Chief of Engineers makes the final decisions to approve or reject the project.[64]

2. Snagging and Clearing for Flood Control

The purpose of this program is to reduce flood damages through the provisions of specialized services. Corps of Engineers designs and constructs the project. Each project selected must be technically feasible, complete within itself, and economically justified. The non-Federal participant must prove all lands, easements, and rights-of-way, and assume all project costs in excess of the Federal limit of $250,000. The participant must also maintain project after construction.

Applicant eligibility is the same as in the preceeding program. In the preapplication procedure, state or local government officials must consult the Dis-

trict Engineer regarding specific problems. An environmental impact statement is also required for any project undertaken by this program.[65]

3. Flood Control Projects

The purpose of this program is to reduce flood damages through projects not specifically authorized by Congress. In this program, Corps of Engineers designs and constructs the project. Each project selected must be technically feasible, complete within itself, and economically justified. The non-federal participant must be responsible for all lands, damages, and project costs in excess of the Federal cost limit of $2,000,000. The cost limit is $3,000,000 if the project is located in an area that has been declared a disaster area pursuant to the Disaster Relief Act of 1966 or the Disaster Relief Act of 1970 in a period five years prior to its authorization. The non-federal participant must provide a cash contribution for land enhancement benefits and for project costs assigned to project features other than flood control. The participant must also prevent future encroachment which might interfere with proper functioning of the project for flood control; and, maintain the project after completion. The application and award process remains the same as the aforementioned programs.[66]

The Corps of Engineers is also authorized to request appropriations from Congress for the construction of large scale projects. This process can be lengthy and coordination between the corps, local officials, and the state delegation to Congress is critical.

IV. Summary

Because of the complexity and expense of a flood control project of this size, it is imperative that a single agency be authorized to implement this project. This agency must be relentless and timeless in the pursuit of its long term objective. Conservancy districts, because of their legal capabilities and powers, have the ability to carry out these long term objectives. Congressional appropriations, through the Corps of Engineers, will be needed to complete any comprehensive flood control project in this area. The conservancy district has the power not only to assist the Corps in funding the project, but also in in obtaining congressional appropriations through intense lobbying of officials.

Until there is Congressional appropriations, the Corps of Engineers projects outlined in this section can only be seen as a limited solution to a much broader problem. Funds available through these programs serve an immediate need of the community. The creation and implementation of a conservancy district on the other hand, provides a comprehensive approach to minimizing the flooding problem for the entire community.

Appendices

Appendix 1

METHODOLOGY FOR ESTIMATING RESIDENTIAL STRUCTURES AND CONTENTS DAMAGE

The methodology used to estimate the flood damage to residential structures and their contents is a modification of a methodology used by the Army Corps of Engineers. The methodology uses charts supplied by the Corps giving the damage, expressed as a percentage of market value, associated with any given flood water depth in the structure. These charts are included at the end of this Appendix.

The first step was to determine the extent of areas actually inundated. This task was completed by Bonar and Associates, an engineering consulting firm retained by the City. Bonar and Associates used field surveys and observations, personal interviews and topographic maps to determine where flooding occurred. This information was transmitted to the Department of Community Development and Planning (CD & P) and to the Allen County Plan Commission on two foot contour maps.

The second step was to determine the number of residential structures in the flooded area, on a block by block basis, that are one story with basement, one story without basement, two story with basement and two story without basement. This was determined through extensive field surveys in flooded areas conducted by CD & P and the Allen County Plan Commission staffs. Information on structure types for each block was recorded on working maps that displayed the two-foot topographic contour lines.

Step three in this methodology was to determine the difference between and average elevation for each block, and the elevation to which the floodwaters reached. For instance, if the average elevation in a block was about 756 feet (above mean sea level), and floodwater in the area reached 760 feet, then each residential structure was assumed to be under four feet of water. This four foot water depth was applied to the depth-damage charts provided by the Corps of Engineers.

The fifth step was to determine the amount of damage on each block. The depth-damage charts give an estimate for each of four residential building types (i.e., single story with basement, single story without basement, two story with basement, two story without basement) of the damage to the structures for each foot of water depth. The damage is expressed in terms of the percentage of the house's market value. To continue with the preceeding example, assume that the block under four feet of water contained one structure of each building type. Houses with no basement, both one and two story, are assumed to have four feet of water over the floor. The chart is read across at the four foot level indicating the one story home with no basement suffered 28 percent damage (column 1) and the two story house with no basement suffered 20 percent damage (column 2).

Houses with basements are assumed to have a floor level one foot above ground level. These structures under four feet of water would have only three feet of water above the first floor. Reading across at the three foot level, the chart indicates that the one story house with basement suffered 28 percent damage (column 3) and the two story house with basement suffered 28 percent damage (column 4).

Damage to the contents of each of these building types was estimated the same way using the depth-damage chart for contents. The assumption is made that the value of the contents is equal to 20 percent of the structures value.

Step six involved applying the amount of damage to the median market value of houses in the neighborhood where the damage occurred. Market values were determined by using the Multiple Listing Service and a knowledgable local real estate broker. The total damage to structures on any given block was determined by the following formula.

[Z percent damage] x [median market value] x
[number of structures receiving Z percent damage]

When this formula was applied to all four structure types for each block, and the damages for all blocks added, the result is an estimate of the total structural damage received across all of the blocks in the study area.

A similar process estimated the damage to contents by factoring in the assumption that contents were valued at 20 percent of the structure's value.

DEPTH PERCENT DAMAGE
RESIDENTIAL CONTENTS

Depth in Feet	(1) All On First Floor	(2) All On First Two Floors	(3) First Floor and Basement	(4) First Two Floors and Basement	All In Basement	All Above First Floor	Mobile Homes
-4			0%	0%	0%		
-3			5	5	45		
-2	0%	0%	7	6	50	0%	0%
-1			8	9	55		
0	10	7	15	11	60	1	3
1	17	9	20	17		2	27
2	23	17	22	22		3	50
3	29	22	28	28		4	65
4	35	28	33	33		5	71
5	40	33	39	39		6	76
6	45	39	44	44		6	78
7	50	44	50	49		6	79
8	55	50	55	55		6	81
9	60	55	60	61		10	83
10		58		64		17	
11		65		71		23	
12		72		76		29	

DEPTH PERCENT DAMAGE
RESIDENTIAL STRUCTURES

Depth in Feet	(1) One Story No Basement	(2) Two or More Stories-No Basement	(3) One Story With Basement	(4) Two or More Stories With Basement
-3			0%	0%
-2			4	3
-1	0%	0%	8	5
0	7	5	11	7
1	10	9	18	11
2	14	13	20	17
3	26	18	23	22
4	28	20	28	28
5	29	22	33	33
6	41	24	38	35
7	43	26	44	38
8	44	31	49	40
9	45	36	51	44
10	46	38	53	46
11	47	40	55	48
12	48	42	57	50

Appendix 2

METHODOLOGY FOR ESTIMATING BUSINESS DAMAGES AND LOSSES

The methodolgy used for estimating flood related damages and losses suffered by local businesses was a two step process:

1. Realistic averages of damages and losses to businesses were generated based on a random sampling of business establishments that actually incurred damages and losses.
2. These averages were then applied to the total number of businesses in the impact areas.

The average damage/loss figures developed here are specific to small, medium, and large businesses in the primary and secondary impact areas.

A list was complied of business establishments located in the primary and secondary impact areas. An attempt was made to contact and survey via telephone (and in some cases personal interviews) each business establishment on the list. The cases where contact was made and information collected constituted the sample. The contact person at each establishment was asked to provide information on the type and amount of damage incurred, the size of the business in square feet and number of employees, and their utilization of flood insurance programs and floodproofing techniques.

For the purposes of accurately representing damages, the data collected on business damages was disaggregated according to three categories of business size: businesses whose floor area was less than 3000 square feet, businesses whose floor area was from 3001 to 10,000 square feet, and businesses whose floor area was larger than 10,000 square feet. For each business size, the

average damage per business was determined by dividing the number of businesses of that size into the total damages reported. Based on the sample of businesses contacted (approximately 35 percent of the total businesses in the primary and secondary impact areas), the following average damages per business were obtained:

	Small (Less than 3000 square feet)	Medium (3001 to 10,000 square feet)	Large Greater than 10,000 square feet
Average damages per business in primary impact area	$ 9,000	$24,000	$207,000
Average damages per business in secondary impact area	$ 4,000	$ 4,000	$ 99,000

The proportions of small, medium, and large businesses, and the average damages per business from the sample were then applied to the total number of businesses. These size-specific damage estimates were summed to obtain total damage estimates for each impact area.

Damage estimates for the potential impact areas were based upon per business average damages in the primary impact areas. The technique was modified to reflect the fact that fewer large businesses are located in the potential impact areas than are located in the primary impact areas.

Appendix 3

BUSINESSES AND INDUSTRIES IN PRIMARY AND SECONDARY IMPACT AREAS

Business Establishments in Primary Impact Areas

Superior Business Forms
Furniture Crafts
M&W Elite Motors
Huth Tool and Machine
Ace Radiator Works
Joy's Poodle Grooming
North Side Plumbing and Heating
Lassus Brothers Oil
Anthony Motor Parts
Avis Rent-a-Car
Robert's Truck Rental and Leasing
Charles Willer Productions
Tri-City Automotive Warehouse
Summit City Radiator
Savon Furniture
Poinsatte Motors
Russ Moore Transmission
National Auto Radio Service
International Harvestor Truck Sales
Jartran Truck Rental
Consolidated Time Service
Pediatric Clinic
Atz Ice Cream
Peoples Trust Bank
Dawson Foor Covering
Whitesell and Associates
Electronic Control Systems
Executive Coffee Service
Advance Electric
American Steel Service Center
Means Service Center
Foremost Displays
Robert Crosby General Contractor
Interstate Trucking
Stoney's Auto Sales
Bruiks, Inc.
Kirby Vacuum
River Tavern
Gensic Sheet Metal
Swaidner Refrigerator
McCoy Bolt
Mainstreet Productions
Martinez, Inc.

Bradbury Enterprises
Bob Stone and Sons
Midwest Drywall
Kuhnke Construction
Thrifty Cleaners
General Electric Co.
Parra Service Station
Taylor Fruit Market
Yoquelet's Tavern
Johnnies West Tavern
Harmon Maintenance Service
Stearn's Moving and Storage
Joslyn Stainless Steel
Joslyn Fort Wayne Credit Union
American Hoist and Derrick
Wiley's Bar
Italian Connection Restaurant
Brad Bowman Body Shop
Hoosier Auto Sales
Wake-Up Oil Co.
Murray Equipment
Tri-State Pet Grooming
Metro Creative Associates
Susie's Pet Grooming
Paulausky Lawn and Garden
Kings Body Repair
Dynamics Financial Leveraging
Mom's Restaurant
Sobriety Club
Roommate Finders
Three Rivers Upholstery
O'Sullivans Italian Pub
Main-Way Launderette
Ace Printing
Brick Bar
Korte Paper Company
Tri-State, Inc.
J.J. Auction
Bartlett Tree Expert
Carson Pirie Scott and Co.
Commercial Wholesale Cartage
Boyan Woodcraft
Summit City Floors

Parker Auto Sales
Federal Insulation
Lincoln Logotype
Flaugh Motor Sales
Redwood Inn
Nite Gallery
Payment Used Cars
Al's Litho Plate
Saving Time Advertising
Central Soya
Ward Aluminun Casting
E.T. Realty
Zemco Manufacturing
Lakeview Window
Druhot Gift Advertising
Robertson Associates
Volunteers of America
General Telephone
S.K. Wrecker Service
Dresser Industries
Opportunities, Inc.
Peterink Sales and Service
Ream Steckbeck Paint
Broadway Sewing Center
Fort Wayne Rescue Mission
Nowak and Williams Supply
Auto Radiator Works
Valley Equipment
Kensill Wrecker Service
Mel's Service Center
Pearson, Inc.
Acme Duplicating and Printing
Interior Products Supply
Remmington Aluminum
Summit City Transfer
Hoosier Photo Supplies
NIPSCO
Finex Car Furnishings
A & J Enterprises
Summit City Welding
Adams Auto Body Trim
Stollers, Inc.
Leath Furniture
Hughies Enterprises
Aztec Tool and Die
Superior Super Gas
Riverside Motors
Strahm, Inc.
Irmscher and Sons
Container Corp of America
Howard Midwest/Howard Graphics
Fort Wayne Liquor
Roller Dome South
Roussel Concrete Construction
Plymouth Enterprises
Engineered Roofing and Coating
Peter Eckrich and Sons
M-B Service Center
Allen County Motors/Bowlin Gaff Car Rental
Westwood Lanes
Imperial Trophy and Awards
McMahan-McClead Vet Clinic
El Charro
Clark Service Station
Mister Donut
Charlies Two Chicken
Azars Restaurant
House of Honda
Hinsey's Pro Paint
Midwest Towels
Midwest Barrels
Unique Clean Up
Interior Surface Cover
S and B Auto Parts
Barker Real Estate
Fairview Golf Course
Sound Thermal Energy Control
Ski Pole
Doerflein Insurance
Fairview Plaza Barber Shop
Davids Fairview Beauty Shop
Family Video
Southtown Vet Associates
Car Specialist
Red Carpet Cab
Ziebart Rustproofing
Butler Refrig and Air Conditioning
Holland Auto Mart
Knipscheer Body Shop
Straub Brothers
Wayne Home Equipment Company
Modern Comfort
Pioneer Paper Stock
ACRO Products
Top of Indiana Beef
Stadler-Wayne, Inc.
Village Pools
Ely Motel and Mobile Home Court
Riverview Drive and Putt
E & N Auto Sales
Kreidt Company
Wagner Tool Grinding
William Didier and Sons
Call's Body Shop
Kaiser Tool Company
Brake Materials and Parts

Private Eye
Roehm Marine
Pine Haven Motel
Bluffton Road Furniture
Universal Printers
P.B. Stewart and Co.
Denny's Bike Shop
Water Meister Sports
Universal Home Modernization
Airwick Professional Products
R.M. North Company
Mansfield Materials
Digital Data Systems
Super Carpet Cleaning
J.R.P. Machine Products
S&M Cabinets
Wilbur Quickering
Siebold-Price Tree & Landscaping
VIP Company
Kerr Moving and Storage
Masolite Concrete Products
Indiana Rolling Mill Baling Corp.
Dominae Advertising
Roy's Bargain Store
Woodward Tire Sales and Service
Mel's Battery Service
Osborne Insurance
Rainbow Furniture
ITT Continental Baking Company
Fort Wayne Paving
Ace Auto Body
Behlen Manufacturing
Indian Head Truck Lines
Fire Prevention Co.
RKO Bottlers

A-One Sanitary Sewer Service
Metro Motors
Barb's Countertop
Lawn and Turf Landscaping
Broadview Florist
Three Rivers Montessori
Village Inn Tavern
Hobart Food Machines
Lynmont Manufacturing
Supperior Auto
Bruco Industries
O'Reilley Office Supply
Fort Wayne Drug Company
Schaab Metal Products
Airco Asbestos
Morris Sellar and Company
USWA Local 14
Putt-Putt Golf Course
Burger-Chef
Mister Coney
C and C Auto Parts
Lassus Fuel Co.
Kelley Box and Packaging Company
Kammeier Trucking
Fort Wayne Freightways
Kains Motor Service
Spath's Body Shop
Fort Wayne Produce
Brooks Construction
R and J Construction
Summit Engineering Service
McGraw Service and Supply
Mid-American Truck Lines
Fort Wayne Turners, Inc.
Rudi's Bar

Business Establishments in Secondary Impact Area

Indiana & Michigan Electric Co.
Roe's Sanding
Northside Piano Teaching Studio
Miller Advertising
Wayne V. Cooley, Inc.
Fort Wayne Marriage Counseling
Advertising Company of Fort Wayne
Boulevard Interiors, Inc.
Skinner M. Hand Bookbinder
Back Porch of Hairstyle
Dick Mills Garage
Rotobur Tool Div.
Tree House Styling Salon
Mueller's Appliance Parts
Blough Pharmacy
State Farm Insurance Co.
Power Tool Supply, Inc.
Lassus Brothers, Inc. #14
Jehovah's Witnesses Kingdom Hall
Leland Smith Agency, Inc.
HSH Development Corp.
Penquin Point #26
Cole Realty & Construction
Hefner Chevrolet, Inc.
American Diabeties Assoc.
Shively Auto & Bocy Shop
MLA of Fort Wayne, Inc.
Lincoln Printing
Twenty Twenty Beauty Salon
The Income Property Specialists
Alert Security Co.
Herbst Hep's Dairy Store
Elder Artisan's Shop
Dorlene's Knit Knack
Maxillo Facial Surgery, Inc.
Hubert Silvero, M.D.
Citgo Quick Mart
Retirement Planning Services
Bankers Life Insurance
Frybarger Morrissey
D.O. McComb & Sons
Aumiller's Barber Shop
Lake and Anthony Styling Salon
Huston Lakeside Pharmacy
Neal Feichter Insurance Agency
Stedman Studio's Inc.
Corner Veterinary Clinic
Referral Carpet Cleaning
Allen County Press
El Azteca Restaurant
Doehrman Tire Service
E. State Auto Sales
Marla's Maid Service
Grass Green Co., Inc.
Kiek's Antique Clocks
Turnbell Engineering
Oxford Chemicals
Westran Corp.
Gibson, Tourney & Kim, Inc.
Adams J. Keyes Gift Shop
St. Joe Athletic Club
Emenhiser Realty
Historic Fort Wayne
Joconda Limited Antiques
T.J. Styling Studio
Marchands Optical Repair
Anderson Insurance Agency
I&M Employees Credit Union
Dulin, Ward & DeWald, Inc.
Lawton Nursing Home
Dictaphone Corp.
Heilman Agencies, Inc.
Mobil Oil Service
Old Fort Draperies
Sherbondy Associates
Salisbury Insurance Agency
Thom Brown Auto Sales
Joseph B. Stoody, Jr., & Assoc.
7-11 Stores
Unicorn Interiors
Landlord Realty, Co.
Gene Custance
Rollin B. Mason Home Repair
Doell Manufacturing, Inc.
Belmont Liquor Store
Psychiatric Services, Inc.
James F. Ruble, D.D.S.
Metropolitan Account Services, Inc.
Guardian Life Insurance
Albersmeyer Real Estate
T. F. Owens & Associates
Apex Specialty Products Co.
S.A. Rowe Interiors
One Hour Dutch Cleaners
Gloria's Taco Inn
Erv Heider Insurance Agency
Reddings Self Service Grocery
L.R. Sharon Interior Decorator
Boulevard House of Hair Styling
Failors Service Center
Bastress Studio, Inc.
Pletcher L. Louis & Co.
The Old Mill Shoppe, Inc.
Depos Tailoring

Appendix 4

FEDERAL AGENCY MANAGEMENT ADMINISTRATION INTERAGENCY TASK FORCE

The following individuals participated in the Federal Agency Management Administration Interagency Task Force.

Jim J. Allen	Federal Highway Administration
Larry Bailey	FEMA
Harry P. Blus	U.S. Dept. Housing & Urban Development
Ronald Buddecke	Federal Coordinating Officer
Duane Conger	U.S. Geological Survey
Dick Cox	FEMA
Jan Craig	FEMA
Jan Domenico	FEMA
Ralph Dominica	National Flood Insurance Program
Don Eusey	Indiana State Highway
Carl Fowler	National Flood Insurance Program
Bob Freitag	FEMA
Kevin Jessup	Small Business Administration
Bruce P. Johnson	Corps of Engineers, North Central Div.
Chester Marcyn	EPA, Region V
Bill Marsh	Small Business Administration
Bill Patterson	State of Indiana-Coordinating Offices
Richard J. Price	Corps of Engineers, Detroit
Jock Robertson	FEMA
Mel Schneider	FEMA
James Stall	USDA-Farmer's Home Administration
Roger Stokes	Federal Highway Administration
Sol Summer	National Weather Service
Calvin Teuser	FEMA
Bill Trakimas	Indiana Department of Natural Resources

Footnotes

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2) Ibid., pg. 550.

3) Fort Wayne Journal-Gazette, March 1 through 9, 1908.

4) Fort Wayne News-Sentinel, March 23 through 27, 1913.

5) Fort Wayne Journal-Gazette, January 14 through 18, 1930.

6) Fort Wayne News-Sentinel, February 26, 1936.

7) Fort Wayne Journal-Gazette, May 13 through 20, 1943.

8) Fort Wayne Journal-Gazette, February 14 through 18, 1950.

9) Fort Wayne Journal-Gazette, February 10 through 15, 1959

10) Fort Wayne Journal-Gazette, March 22 through 24, 1978

11) Information from William L. Sweet, Allen County Surveyor, April, 1982.

12) Report on Flood Control for Fort Wayne, Indiana and Vicinity in the Maumee River Basin, Indiana and Ohio, U.S. Army Corps of Engineers, Detroit District, June, 1959.

13) Preliminary Feasibility Report for Flood Control, Fort Wayne and Vicinity Indiana, U.S. Army Corps of Engineers, Detroit District, June, 1976.

14) Fort Wayne Weekly Sentinel, March 1, 1876.

15) Environmental Conditions of Allen County, Indiana, Solar Collective of Northeast Indiana, July 1, 1981.

16) The Community Development Block Grant Program in Fort Wayne 1982-1984, Part Two: Community Development and Housing Plan, City of Fort Wayne, Department of Community Development and Planning, January, 1982.

17) Business Barometer, Fort Wayne Chamber of Commerce, December, 1981.

18) Profiles of Change, Annual Report, R.L. Polk and Co., 1979-1980.

19) Structural Conditions Survey, Fort Wayne, Community Development and Planning, 1979.

20) Profiles of Change, op. cit.

21) Overall Economic Development Program Update, Allen-County Economic Development Task Force, June 1980

22) Barbara O. Morrow, "Anatomy of a Flood", Fort Wayne Journal-Gazette, Thursday, March 18, 1982, page 1A. 4A.

23) Federal Emergency Management Agency, Flood Hazard Mitigation Report, p. 2.

24) City-County Building Department, 'Flood Damage Inspection Report."

25) Bonar and Associates, Inc., draft reports to the Department of Community Development and Planning received April, 1982.

26) Ibid.

27) Ibid.

28) Conversations with Captain Perry Collins, Air National Guard and Major Bawter, Army National Guard.

29) Conversation with Lt. Howard Smith, Indiana State Police.

30) Conversation with Jerry Dolein, Chief of Emergency Management.

31) Ibid.

32) Bonar and Associates, Inc., op. cit.

33) Conversation with David Kiester, coordinator of sandbagging effort during the flood.

34) Interview with Michael Snyder, American Red Cross.

35) Department of Community Development and Planning and Allen County Plan Commission.

36) Traffic counts provided by Fort Wayne Traffic Engineering Department.

37) Bonar and Associates, Inc., op. cit.

38) Fort Wayne Street Department

39) Bonar and Associates, Inc., op. cit.

40) Ibid.

41) Ibid.

42) Ibid.

43) Fort Wayne Department of Water Pollution Control

44) Bonar and Associates, Inc., op. cit.

45) Ibid.

46) Ibid.

47) Fort Wayne Department of Water Pollution Control

48) Bonar and Associates, Inc., op. cit.

49) Fort Wayne Parks and Recreation Department

50) Bonar and Associates, Inc., op. cit.

51) Bonar and Associates, Inc., op. cit.

52) Interview with Michael Snyder and Bob Berge, American Red Cross

53) Ibid.

54) Curt Smith, "Hopes Resting on Dirt", Fort Wayne Journal-Gazette, Friday, March 19, 1982, pages 1A, 3A.

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56) Bonar and Associates, Inc., op. cit.

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64) 1945 Rivers and Harbors Act, Public Law 79-14, 33 U.S.C. 603a.

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66) 1948 Flood Control Act, Amended, Section 205, Public Law 80-858, 33 U.S.C. 701s, amended by Public Law 93-251